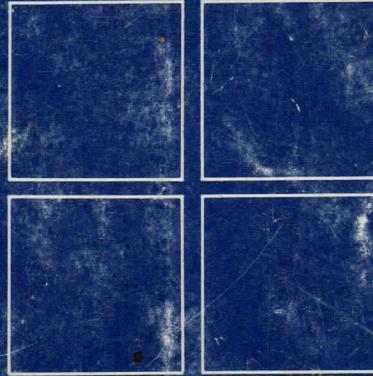


# **DESIGN VALUES FOR WOOD CONSTRUCTION**



**A Supplement  
to the  
1986 Edition**

**NATIONAL  
DESIGN  
SPECIFICATION  
FOR WOOD  
CONSTRUCTION**

**January 1986**

**National  
Forest Products  
Association**

1619 Massachusetts Ave., N.W.  
Washington, D.C. 20036

# DESIGN VALUES FOR WOOD CONSTRUCTION

## INTRODUCTION

This Supplement is an integral part of the National Design Specification for Wood Construction (NDS), 1986 Edition. It provides design values for structural lumber and structural glued laminated timber.

### Lumber

The design values for lumber in this Supplement are obtained from grading rules published by seven agencies: National Lumber Grades Authority (a Canadian agency), Northeastern Lumber Manufacturers Association, Northern Hardwood and Pine Manufacturers Association, Redwood Inspection Service, Southern Pine Inspection Bureau, West Coast Lumber Inspection Bureau and Western Wood Products Association. The grading rules promulgated by these agencies, including the design values therein, have been approved by the Board of Review of the American Lumber Standards Committee and certified for conformance with U.S. Department of Commerce Voluntary Product Standard PS 20-70, "American Softwood Lumber Standard".

Design values for visually graded lumber are based on the provisions of ASTM Designation D245, "Methods for Establishing Structural Grades and Related Allowable Properties for Visually Graded Lumber". These methods involve adjusting the strength properties of small clear specimens of wood, as given in ASTM Designation D2555, "Methods for Establishing Clear Wood Strength Values", for the effects of knots, slope of grain, splits, checks, size, duration of load, moisture content and other influencing factors, to obtain design values applicable to normal conditions of service. Lumber structures designed on the basis of working stresses derived from ASTM D245 procedures and standard design criteria have a long history of satisfactory performance.

The appropriateness of lumber design values is regularly evaluated on the basis of experience of experimental data developed on the properties and performance of clear wood specimens or full size lumber pieces. Reduced tension parallel to grain values appearing in this Supplement for some sizes of visually graded lumber reflect new test information on actual lumber grades and sizes. Such modifications in stresses for individual pieces of lumber may not always be reflected in changed usage of trusses or other structural assemblies involving appropriately joined pieces of lumber or other materials. Performance of these assemblies depends not only on design values for the individual elements, but also on assumptions made in estimating the stresses induced in each member, assumptions regarding fastener rigidity, the relationship between assumed and actual loads on the structure, estimated versus actual environmental exposure conditions, and the quality of fabrication. These factors are all subject to adjustment or revision based on experimental evidence, experience, and the application of improved stress analysis procedures.

Design values for machine stress rated (MSR) lumber are based on nondestructive stiffness testing of individual pieces. Certain visual grade requirements also apply to such lumber. The stress rating system used for MSR lumber is regularly checked by the responsible grading agency for conformance to established certification and quality control procedures.

For additional information on development and applicability of lumber design values, the grading rules published by the individual agencies and the referenced ASTM Standards should be consulted.

### Glued Laminated Timber

Design values in this Supplement for glued laminated timber are developed and published by the American Institute of Timber Construction (AITC) in accordance with principles originally established by the U.S. Forest Products Laboratory in 1950. These principles involve adjusting strength properties of clear straight grained lumber to account for knots, slope of grain, density, size, number of laminations and other factors unique to laminated timber.

Specific methods used to establish design values have been revised and improved since 1950 to reflect the results of tests of large glued laminated timber members conducted by the U.S. Forest Products Laboratory and university research organizations. Changes have included development of new limitations on knots in outer tension laminations, new adjustments for size effect and reductions in tension stresses. The performance history of structures made with glued laminated timber conforming to AITC specifications and manufactured in accordance with American National Standard ANSI/AITC A190.1-1983, "Structural Glued-Laminated Timber", has demonstrated the adequacy of the methods used to establish laminated timber design values.

Suggestions and recommendations for revision of glued laminated timber design values are provided on a regular basis by AITC's Technical Advisory Committee which consists of representatives of government, universities, practicing engineers and industry.

### Conditions of Use

Design values presented in this Supplement are for normal loading under dry conditions of service. Because the strength of wood varies with conditions under which it is used, these design values should only be applied in conjunction with appropriate design and service recommendations from the NDS. Additionally, the design values in this supplement apply only to material identified by the grade mark of, or certificate of inspection issued by a grading or inspection bureau or agency recognized as being competent.

#### NOTE

To facilitate use of the Supplement, color coding has been employed to distinguish different moisture content conditions and to distinguish the 2-inch to 4-inch wide light framing grades from the 5-inch and wider joist and plank grades.

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**TABLE 4A—DESIGN VALUES FOR VISUALLY GRADED STRUCTURAL LUMBER**

(Design values listed are for normal loading conditions. See other provisions in the footnotes and in the National Design Specification for adjustments of tabulated values.)

Species and commercial grade	Size classification	Design values in pounds per square inch							Grading rules agency	
		Extreme fiber in bending "F <sub>B</sub> "		Tension parallel to grain "F <sub>T</sub> "	Horizontal shear "F <sub>V</sub> "	Compression perpendicular to grain "F <sub>C</sub> ⊥"	Compression parallel to grain "F <sub>C</sub> "	Modulus of elasticity "E"		
		Single-member uses	Repetitive-member uses							
<b>ASPEN</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural		1300	1500	775	60	265	850	1,100,000	NELMA NHPMA WWPA  (See footnotes 1-11 and 20)	
No. 1	2" to 4" thick	1100	1300	650	60	265	675	1,100,000		
No. 2	2" to 4"	925	1050	525	60	265	550	1,000,000		
No. 3	wide	500	575	300	60	265	325	900,000		
Appearance Stud		1100	1300	650	60	265	825	1,100,000		
Construction Standard Utility		500	575	300	60	265	325	900,000		
Select Structural		650	750	400	60	265	625	900,000		
No. 1	2" to 4" thick	375	425	225	60	265	500	900,000		
No. 2	4" wide	175	200	100	60	265	325	900,000		
Select Structural		1150	1300	750	60	265	750	1,100,000		
No. 1	2" to 4" thick	950	1100	650	60	265	675	1,100,000		
No. 2	5" and wider	775	900	425	60	265	575	1,000,000		
No. 3		450	525	250	60	265	375	900,000		
Appearance Stud		950	1100	650	60	265	825	1,100,000		
		450	525	250	60	265	375	900,000		
<b>BALSAM FIR</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural		1750	2000	1000	70	305	1350	1,500,000	NELMA NHPMA  (See footnotes 1-12 and 20)	
No. 1	2" to 4" thick	1450	1700	850	70	305	1050	1,500,000		
No. 2	2" to 4"	1200	1400	700	70	305	850	1,300,000		
No. 3	wide	675	775	400	70	305	525	1,200,000		
Appearance Stud		1450	1700	850	70	305	1250	1,500,000		
Construction Standard Utility		675	775	400	70	305	525	1,200,000		
Select Structural		875	1000	525	70	305	950	1,200,000		
No. 1	2" to 4" thick	500	575	275	70	305	775	1,200,000		
No. 2	4" wide	225	275	125	70	305	525	1,200,000		
Select Structural		1500	1700	1000	70	305	1200	1,500,000		
No. 1	2" to 4" thick	1250	1450	850	70	305	1050	1,500,000		
No. 2	5" and wider	1050	1200	550	70	305	900	1,300,000		
No. 3		600	700	325	70	305	575	1,200,000		
Appearance Stud		1250	1450	850	70	305	1250	1,500,000		
		600	700	325	70	305	575	1,200,000		
Select Structural	Beams and Stringers	1350	—	900	65	305	950	1,400,000	NHPMA  (See footnotes 1-12 and 20)	
No. 1		1100	—	750	65	305	800	1,400,000		
Select Structural	Posts and Timbers	1250	—	825	65	305	1000	1,400,000		
No. 1		1000	—	675	65	305	875	1,400,000		
Select Structural	Beams and Stringers	1350	—	900	65	305	950	1,400,000	NELMA  (See footnotes 1-12 and 20)	
No. 1		1100	—	750	65	305	800	1,400,000		
No. 2		725	—	350	65	305	500	1,100,000		
Select Structural	Posts and Timbers	1250	—	825	65	305	1000	1,400,000		
No. 1		1000	—	675	65	305	875	1,400,000		
No. 2		575	—	375	65	305	400	1,100,000		
Select Commercial	Decking	—	1650	—	—	—	—	1,500,000		
		—	1400	—	—	—	—	1,300,000		
<b>BLACK COTTONWOOD</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural		1000	1200	600	50	180	725	1,200,000	NLGA  (A Canadian agency. See footnotes 1-12, 15, 16 and 20)	
No. 1	2" to 3" thick	875	1000	500	50	180	575	1,200,000		
No. 2	2" to 4"	725	825	425	50	180	450	1,100,000		
No. 3	wide	400	450	225	50	180	275	900,000		
Appearance Stud		875	1000	500	50	180	700	1,200,000		
Construction Standard Utility		400	450	225	50	180	275	900,000		
Select Structural	2" to 4" thick	525	600	300	50	180	525	900,000		
No. 1	4" wide	300	325	175	50	180	425	900,000		
No. 2		150	150	75	50	180	275	900,000		
Select Structural		875	1000	575	50	180	650	1,200,000		
No. 1	2" to 4" thick	750	875	500	50	180	575	1,200,000		
No. 2	5" and wider	625	700	325	50	180	475	1,100,000		
No. 3		350	425	175	50	180	300	900,000		
Appearance Stud		750	875	500	50	180	700	1,200,000		
		350	425	175	50	180	300	900,000		

**TABLE 4A—DESIGN VALUES FOR VISUALLY GRADED STRUCTURAL LUMBER**

(Design values listed are for normal loading conditions. See other provisions in the footnotes and in the National Design Specification for adjustments of tabulated values.)

Species and commercial grade	Size classification	Design values in pounds per square inch							Grading rules agency	
		Extreme fiber in bending "F <sub>b</sub> "		Tension parallel to grain "F <sub>T</sub> "	Horizontal shear "F <sub>v</sub> "	Compression perpendicular to grain "F <sub>c</sub> ⊥"	Compression parallel to grain "F <sub>c</sub> "	Modulus of elasticity "E"		
		Single-member uses	Repetitive-member uses							
<b>CALIFORNIA REDWOOD</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Clear Heart Structural	4" & less thick, any width	2300	2650	1550	145	650	2150	1,400,000	RIS (See footnotes 1-6 and 8-12)	
Clear Structural		2300	2650	1550	145	650	2150	1,400,000		
Select Structural	2" to 4"	2050	2350	1200	80	650	1750	1,400,000		
Select Structural, open grain		1600	1850	950	80	425	1300	1,100,000		
No. 1	2" to 4"	1700	1950	975	80	650	1400	1,400,000		
No. 1, Open grain	thick	1350	1550	775	80	425	1050	1,100,000		
No. 2	2" to 4"	1400	1600	800	80	650	1100	1,250,000		
No. 2, Open grain	wide	1100	1250	625	80	425	825	1,000,000		
No. 3		800	900	475	80	650	675	1,100,000		
No. 3, Open grain		625	725	375	80	425	500	900,000		
Stud		625	725	375	80	425	500	900,000		
Construction	2" to 4"	825	950	475	80	425	925	900,000	RIS (See footnotes 1-6 and 8-12)	
Standard	thick	450	525	250	80	425	775	900,000		
Utility	4" wide	225	250	125	80	425	500	900,000		
Select Structural	2" to 4"	1750	2000	1150	80	650	1550	1,400,000		
Select Structural, Open grain		1400	1600	925	80	425	1150	1,100,000		
No. 1	2" to 4"	1500	1700	975	80	650	1400	1,400,000		
No. 1, Open grain	thick	1150	1350	775	80	425	1050	1,100,000		
No. 2	5" and wider	1200	1400	650	80	650	1200	1,250,000		
No. 2, Open grain		950	1100	500	80	425	875	1,000,000		
No. 3		700	800	375	80	650	725	1,100,000		
No. 3, Open grain		550	650	350	80	425	525	900,000		
Stud		700	800	375	80	425	725	1,100,000		
Clear Heart Structural or Clear Structural	5" by 5" and larger	1850	—	1250	135	650	1650	1,300,000	RIS (See footnotes 1, 2, 8 and 9)	
Select Structural		1400	—	950	95	650	1200	1,300,000		
No. 1		1200	—	800	95	650	1050	1,300,000		
No. 2		975	—	650	95	650	900	1,100,000		
No. 3		550	—	375	95	650	550	1,000,000		
Select Decking, Close grain	Decking	1850	2150	—	—	—	—	1,400,000		
Select Decking	2" thick	1450	1700	—	—	—	—	1,100,000		
Commercial Decking	6" and wider	1200	1350	—	—	—	—	1,000,000		
<b>COAST SITKA SPRUCE</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural	2" to 3"	1500	1700	875	65	455	1100	1,700,000	NLGA (A Canadian agency. See footnotes 1-12, 15, 16 and 20)	
No. 1	thick	1250	1450	750	65	455	875	1,700,000		
No. 2	2" to 4"	1050	1200	625	65	455	700	1,500,000		
No. 3	wide	575	675	350	65	455	425	1,300,000		
Appearance Stud		1250	1450	725	65	455	1050	1,700,000		
Stud		575	675	350	65	455	425	1,300,000		
Construction	2" to 4"	750	875	450	65	455	800	1,300,000		
Standard	thick	425	500	250	65	455	650	1,300,000		
Utility	4" wide	200	225	125	65	455	425	1,300,000		
Select Structural	2" to 4"	1300	1500	850	65	455	975	1,700,000		
No. 1	thick	1100	1250	725	65	455	875	1,700,000		
No. 2	5" and wider	900	1050	475	65	455	750	1,500,000	NLGA (A Canadian agency. See footnotes 1-12, 15, 16 and 20)	
No. 3		525	600	275	65	455	475	1,300,000		
Appearance Stud		1100	1250	725	65	455	1050	1,700,000		
Stud		525	600	275	65	455	475	1,300,000		
Select Structural	Beams and Stringers	1150	—	675	60	455	775	1,500,000		
No. 1		950	—	475	60	455	650	1,500,000		
No. 2		625	—	325	60	455	425	1,200,000		
Select Structural	Posts and Timbers	1100	—	725	60	455	825	1,500,000		
No. 1		875	—	575	60	455	725	1,500,000		
No. 2		525	—	350	60	455	500	1,200,000		
Select Commercial	Decking	1250	1450	—	—	455	—	1,700,000		
		1050	1200	—	—	455	—	1,500,000		
<b>COAST SPECIES</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural	2" to 3"	1500	1700	875	65	370	1100	1,500,000	NLGA (A Canadian agency. See footnotes 1-12, 15, 16 and 20)	
No. 1	thick	1250	1450	750	65	370	875	1,500,000		
No. 2	2" to 4"	1050	1200	625	65	370	700	1,400,000		
No. 3	wide	575	675	350	65	370	425	1,200,000		
Appearance Stud		1250	1450	725	65	370	1050	1,500,000		
Stud		575	675	350	65	370	425	1,200,000		
Construction	2" to 4"	750	875	450	65	370	800	1,200,000		
Standard	thick	425	500	250	65	370	650	1,200,000		
Utility	4" wide	200	225	125	65	370	425	1,200,000		
Select Structural	2" to 4"	1300	1500	850	65	370	975	1,500,000		
No. 1	thick	1100	1250	725	65	370	875	1,500,000		
No. 2	5" and wider	900	1050	475	65	370	750	1,400,000	(A Canadian agency. See footnotes 1-12, 15, 16 and 20)	
No. 3		525	600	275	65	370	475	1,200,000		
Appearance Stud		1100	1250	725	65	370	1050	1,500,000		
Stud		525	600	275	65	370	475	1,200,000		
Select Commercial	Decking	1250	1450	—	—	370	—	1,500,000		
		1050	1200	—	—	370	—	1,400,000		

**TABLE 4A—DESIGN VALUES FOR VISUALLY GRADED STRUCTURAL LUMBER**

(Design values listed are for normal loading conditions. See other provisions in the footnotes and in the National Design Specification for adjustments of tabulated values.)

Species and commercial grade	Size classification	Design values in pounds per square inch							Grading rules agency	
		Extreme fiber in bending "F <sub>B</sub> "		Tension parallel to grain "F <sub>T</sub> "	Horizontal shear "F <sub>V</sub> "	Compression perpendicular to grain "F <sub>C</sub> ⊥"	Compression parallel to grain "F <sub>C</sub> "	Modulus of elasticity "E"		
		Single-member uses	Repetitive-member uses							
<b>COTTONWOOD</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Stud	2" to 3" thick 2" to 4" wide	525	600	300	65	320	350	1,000,000	NHPMA (See footnotes 1-12)	
Construction Standard Utility	2" to 4" thick 4" wide	675 375 175	775 425 200	400 225 100	65 65 65	320 320 320	650 525 350	1,000,000 1,000,000 1,000,000		
<b>DOUGLAS FIR-LARCH</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Dense Select Structural		2450	2800	1400	95	730	1850	1,900,000	WCLIB WWPA  (See footnotes 1-12 and 20)	
Select Structural		2100	2400	1200	95	625	1600	1,800,000		
Dense No. 1		2050	2400	1200	95	730	1450	1,900,000		
No. 1	2" to 4" thick	1750	2050	1050	95	625	1250	1,800,000		
Dense No. 2	2" to 4" thick	1700	1950	1000	95	730	1150	1,700,000		
No. 2	2" to 4" wide	1450	1650	850	95	625	1000	1,700,000		
No. 3	800	925	475	95	625	600	600	1,500,000		
Appearance Stud		1750	2050	1050	95	625	1500	1,800,000		
Construction Standard Utility	2" to 4" thick 4" wide	1050 600 275	1200 675 325	625 350 175	95 95 95	625 625 625	1150 925 600	1,500,000 1,500,000 1,500,000		
Dense Select Structural		2100	2400	1400	95	730	1650	1,900,000		
Select Structural		1800	2050	1200	95	625	1400	1,800,000		
Dense No. 1		1800	2050	1200	95	730	1450	1,900,000		
No. 1	2" to 4" thick	1500	1750	1000	95	625	1250	1,800,000		
Dense No. 2	5" and wider	1450	1700	775	95	730	1250	1,700,000		
No. 2		1250	1450	650	95	625	1050	1,700,000		
No. 3		725	850	375	95	625	675	1,500,000		
Appearance Stud		1500	1750	1000	95	625	1500	1,800,000		
Dense Select Structural		725	850	375	95	625	675	1,500,000		
Select Structural	Beams and Stringers	1900	—	1100	85	730	1300	1,700,000	WCLIB (See footnotes 1-12 and 20)	
Dense No. 1		1600	—	950	85	625	1100	1,600,000		
No. 1		1550	—	775	85	730	1100	1,700,000		
No. 2		1300	—	675	85	625	925	1,600,000		
Dense No. 2		875	—	425	85	625	600	1,300,000		
Dense Select Structural		1750	—	1150	85	730	1350	1,700,000	WWPA  (See footnotes 1-13 and 20)	
Select Structural	Posts and Timbers	1500	—	1000	85	625	1150	1,600,000		
Dense No. 1		1400	—	950	85	730	1200	1,700,000		
No. 1		1200	—	825	85	625	1000	1,600,000		
No. 2		750	—	475	85	625	700	1,300,000		
Select Dex Commercial Dex	Decking	1750	2000	—	—	625	—	1,800,000		
		1450	1650	—	—	625	—	1,700,000		
Dense Select Structural		1900	—	1250	85	730	1300	1,700,000		
Select Structural	Beams and Stringers	1600	—	1050	85	625	1100	1,600,000		
Dense No. 1		1550	—	1050	85	730	1100	1,700,000		
No. 1		1350	—	900	85	625	925	1,600,000		
Dense No. 2		1000	—	500	85	730	700	1,400,000		
No. 2		875	—	425	85	625	600	1,300,000		
Dense Select Structural		1750	—	1150	85	730	1350	1,700,000		
Select Structural	Posts and Timbers	1500	—	1000	85	625	1150	1,600,000		
Dense No. 1		1400	—	950	85	730	1200	1,700,000		
No. 1		1200	—	825	85	625	1000	1,600,000		
Dense No. 2		800	—	550	85	730	550	1,400,000		
No. 2		700	—	475	85	625	475	1,300,000		
Selected Decking Commercial Decking	Decking	—	2000	—	—	—	—	1,800,000	1,700,000	
		—	1650	—	—	—	—	1,700,000		
Selected Decking Commercial Decking	Decking	—	2150	(Surfaced at 15% max. m.c. and used at 15% max. m.c.)				—	1,900,000	
		—	1800					—	1,700,000	

**TABLE 4A—DESIGN VALUES FOR VISUALLY GRADED STRUCTURAL LUMBER**

(Design values listed are for normal loading conditions. See other provisions in the footnotes and in the National Design Specification for adjustments of tabulated values.)

Species and commercial grade	Size classification	Design values in pounds per square inch							Grading rules agency	
		Extreme fiber in bending "F <sub>B</sub> "		Tension parallel to grain "F <sub>T</sub> "	Horizontal shear "F <sub>V</sub> "	Compression perpendicular to grain "F <sub>C</sub> ⊥"	Compression parallel to grain "F <sub>C</sub> "	Modulus of elasticity "E"		
		Single-member uses	Repetitive-member uses							
<b>DOUGLAS FIR-LARCH (NORTH)</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural		2100	2400	1200	95	625	1550	1,800,000	NLGA (A Canadian agency. See footnotes 1-12, 15, 16 and 20)	
No. 1	2" to 3"	1750	2050	1050	95	625	1250	1,800,000		
No. 2	thick	1450	1650	850	95	625	1000	1,700,000		
No. 3	2" to 4"	800	925	475	95	625	600	1,500,000		
Appearance	wide	1750	2050	1050	95	625	1500	1,800,000		
Stud		800	925	475	95	625	600	1,500,000		
Construction	2" to 4"	1050	1200	625	95	625	1150	1,500,000		
Standard	thick	600	675	350	95	625	925	1,500,000		
Utility	4" wide	275	325	175	95	625	600	1,500,000		
Select Structural		1800	2050	1200	95	625	1400	1,800,000		
No. 1	2" to 4"	1500	1750	1000	95	625	1250	1,800,000		
No. 2	thick	1250	1450	650	95	625	1050	1,700,000		
No. 3	5" and wider	725	850	375	95	625	675	1,500,000		
Appearance		1500	1750	1000	95	625	1500	1,800,000		
Stud		725	850	375	95	625	675	1,500,000		
Select Structural	Beams and Stringers	1600	—	950	85	625	1100	1,600,000	WWPA (See footnotes 1-13 and 20)	
No. 1		1300	—	675	85	625	925	1,600,000		
No. 2		875	—	425	85	625	600	1,300,000		
Select Structural	Posts and Timbers	1500	—	1000	85	625	1150	1,600,000		
No. 1	Timbers	1200	—	825	85	625	1000	1,600,000		
No. 2		725	—	475	85	625	700	1,300,000		
Select Commercial	Decking	1750	2000	—	—	625	—	1,800,000		
		1450	1650	—	—	625	—	1,700,000		
<b>DOUGLAS FIR SOUTH</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural		2000	2300	1150	90	520	1400	1,400,000	WWPA (See footnotes 1-13 and 20)	
No. 1	2" to 4"	1700	1950	975	90	520	1150	1,400,000		
No. 2	thick	1400	1600	825	90	520	900	1,300,000		
No. 3	2" to 4"	775	875	See Footnote 3	90	520	550	1,100,000		
Appearance	wide	1700	1950	975	90	520	1350	1,400,000		
Stud		775	875	450	90	520	550	1,100,000		
Construction	2" to 4"	1000	1150	600	90	520	1000	1,100,000		
Standard	thick	550	650	325	90	520	850	1,100,000		
Utility	4" wide	275	300	150	90	520	550	1,100,000		
Select Structural		1700	1950	1150	90	520	1250	1,400,000		
No. 1	2" to 4"	1450	1650	975	90	520	1150	1,400,000		
No. 2	thick	1200	1350	625	90	520	950	1,300,000		
No. 3	5" and wider	700	800	350	90	520	600	1,100,000		
Appearance		1450	1650	975	90	520	1350	1,400,000		
Stud		700	800	350	90	520	600	1,100,000		
Select Structural	Beams and Stringers	1550	—	1050	85	520	1000	1,200,000		
No. 1		1300	—	850	85	520	850	1,200,000		
No. 2		825	—	425	85	520	525	1,000,000		
Select Structural	Posts and Timbers	1400	—	950	85	520	1050	1,200,000		
No. 1	Timbers	1150	—	775	85	520	925	1,200,000		
No. 2		650	—	400	85	520	425	1,000,000		
Selected Decking	Commercial Decking	—	1900	—	—	—	—	1,400,000		
Selected Decking	Commercial Decking	—	1600	—	—	—	—	1,300,000		
Selected Decking	Decking	—	2050	(Surfaced at 15% max. m.c. and used at 15% max. m.c.)				—	1,500,000	
Selected Decking	Commercial Decking	—	1750					—		

**TABLE 4A—DESIGN VALUES FOR VISUALLY GRADED STRUCTURAL LUMBER**

(Design values listed are for normal loading conditions. See other provisions in the footnotes and in the National Design Specification for adjustments of tabulated values.)

Species and commercial grade	Size classification	Design values in pounds per square inch							Grading rules agency	
		Extreme fiber in bending "F <sub>B</sub> "		Tension parallel to grain "F <sub>T</sub> "	Horizontal shear "F <sub>V</sub> "	Compression perpendicular to grain "F <sub>C</sub> ⊥"	Compression parallel to grain "F <sub>C</sub> "	Modulus of elasticity "E"		
		Single-member uses	Repetitive-member uses							
<b>EASTERN HEMLOCK</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural No. 1	2" to 4" thick	1750	2050	1050	85	550	1350	1,200,000	NELMA NHPMA (See footnotes 1-12 and 20)	
No. 2	1250	1750	875	85	550	1050	1,200,000			
No. 3	1450	725	85	550	850	850	1,100,000			
Appearance Stud	675	800	400	85	550	525	1,000,000			
Construction Standard Utility	1500	1750	875	85	550	1250	1,200,000			
Select Structural No. 1	675	800	400	85	550	525	1,000,000			
No. 2	900	1050	525	85	550	950	1,000,000			
No. 3	500	575	300	85	550	800	1,000,000			
Appearance Stud	250	275	150	85	550	525	1,000,000			
Select Structural No. 1	1550	1750	1000	85	550	1200	1,200,000			
No. 2	1300	1500	875	85	550	1050	1,200,000			
No. 3	1050	1250	550	85	550	900	1,100,000			
Appearance Stud	625	700	325	85	550	575	1,000,000			
Select Structural No. 1	1300	1500	875	85	550	1250	1,200,000			
No. 2	625	700	325	85	550	575	1,000,000			
Select Structural No. 1	Beams and Stringers	1350	—	925	80	550	950	1,200,000	NHPMA (See footnotes 1-12 and 20)	
No. 2	1150	—	—	775	80	550	800	1,200,000		
Select Structural No. 1	Posts and Timbers	1250	—	850	80	550	1000	1,200,000	NELMA (See footnotes 1-12 and 20)	
No. 2	1050	—	—	700	80	550	875	1,200,000		
Select Structural No. 1	Beams and Stringers	1350	—	925	80	550	950	1,200,000	NELMA (See footnotes 1-12 and 20)	
No. 2	1150	—	—	775	80	550	800	1,200,000		
Select Structural No. 1	750	—	375	80	550	550	900,000			
Select Structural No. 1	Posts and Timbers	1250	—	850	80	550	1000	1,200,000	NELMA (See footnotes 1-12 and 20)	
No. 2	1050	—	—	700	80	550	875	1,200,000		
Select Structural No. 2	600	—	400	80	550	400	900,000			
<b>EASTERN HEMLOCK — TAMARACK</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural No. 1	1800	2050	1050	85	555	1350	1,300,000	NELMA NHPMA (See footnotes 1-12 and 20)		
No. 2	1500	1750	900	85	555	1050	1,300,000			
No. 3	1250	1450	725	85	555	850	1,100,000			
Appearance Stud	700	800	400	85	555	525	1,000,000			
Construction Standard Utility	700	800	400	85	555	1300	1,300,000			
Select Structural No. 1	2" to 4" thick	900	1050	525	85	555	950	1,000,000		
No. 2	500	575	300	85	555	800	1,000,000			
No. 3	250	275	150	85	555	525	1,000,000			
Select Structural No. 1	1550	1750	1050	85	555	1200	1,300,000			
No. 2	1300	1500	875	85	555	1050	1,300,000			
No. 3	1050	1200	575	85	555	900	1,100,000			
Appearance Stud	625	725	325	85	555	575	1,000,000			
Select Structural No. 1	1300	1500	875	85	555	1300	1,300,000			
No. 2	625	725	325	85	555	575	1,000,000			
Select Structural No. 1	Beams and Stringers	1400	—	925	80	555	950	1,200,000	NHPMA (See footnotes 1-12 and 20)	
No. 2	1150	—	—	775	80	555	800	1,200,000		
Select Structural No. 1	Posts and Timbers	1300	—	875	80	555	1000	1,200,000	NELMA (See footnotes 1-12 and 20)	
No. 2	1050	—	—	700	80	555	875	1,200,000		
Select Structural No. 1	Beams and Stringers	1400	—	925	80	555	950	1,200,000	NELMA (See footnotes 1-12)	
No. 2	1150	—	—	775	80	555	800	1,200,000		
Select Structural No. 2	750	—	375	80	555	500	900,000			
Select Structural No. 1	Posts and Timbers	1300	—	875	80	555	1000	1,200,000	NELMA (See footnotes 1-12)	
No. 2	1050	—	—	700	80	555	875	1,200,000		
Select Structural No. 1	600	—	400	80	555	400	900,000			
Select Commercial	Decking	1500	1700	—	—	—	—	1,300,000	NELMA (See footnotes 1-12)	
		1250	1450	—	—	—	—	1,100,000		

**TABLE 4A—DESIGN VALUES FOR VISUALLY GRADED STRUCTURAL LUMBER**

(Design values listed are for normal loading conditions. See other provisions in the footnotes and in the National Design Specification for adjustments of tabulated values.)

Species and commercial grade	Size classification	Design values in pounds per square inch							Grading rules agency	
		Extreme fiber in bending "F <sub>B</sub> "		Tension parallel to grain "F <sub>T</sub> "	Horizontal shear "F <sub>V</sub> "	Compression perpendicular to grain "F <sub>C</sub> ⊥"	Compression parallel to grain "F <sub>C</sub> "	Modulus of elasticity "E"		
		Single-member uses	Repetitive-member uses							
<b>EASTERN HEMLOCK-TAMARACK (NORTH)</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural	2" to 3"	1800	2050	1050	85	555	1350	1,300,000	NLGA  (A Canadian agency. See footnotes 1-12, 15, 16 and 20)	
No. 1	thick	1500	1750	900	85	555	1050	1,300,000		
No. 2	2" to 4"	1250	1450	725	85	555	850	1,100,000		
No. 3	wide	700	800	400	85	555	525	1,000,000		
Appearance Stud		1500	1750	900	85	555	1300	1,300,000		
Construction Standard Utility	2" to 4"	900	1050	525	85	555	975	1,000,000		
	thick	500	575	300	85	555	800	1,000,000		
	4" wide	250	275	150	85	555	525	1,000,000		
Select Structural	2" to 4"	1550	1750	1050	85	555	1200	1,300,000		
No. 1	thick	1300	1500	875	85	555	1050	1,300,000		
No. 2	5" and wider	1050	1200	575	85	555	900	1,100,000		
No. 3		625	725	325	85	555	575	1,000,000		
Appearance Stud		1300	1500	875	85	555	1300	1,300,000		
Select Structural	Beams and Stringers	1450	—	850	85	555	950	1,300,000		
No. 1		1200	—	600	85	555	800	1,300,000		
No. 2		775	—	400	85	555	500	1,100,000		
Select Structural	Posts and Timbers	1350	—	900	85	555	1000	1,300,000		
No. 1		1100	—	725	85	555	875	1,300,000		
No. 2		650	—	425	85	555	600	1,100,000		
Select Commercial	Decking	1500	1700	—	—	555	—	1,300,000		
		1250	1450	—	—	555	—	1,100,000		
<b>EASTERN SOFTWOODS</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural	2" to 4"	1350	1550	800	70	335	1050	1,200,000	NHPMA (See footnotes 1-12)	
No. 1	thick	1150	1350	675	70	335	825	1,200,000		
No. 2	2" to 4"	950	1100	550	70	335	650	1,100,000		
No. 3	wide	525	600	300	70	335	400	1,000,000		
Stud	2" to 4"	525	600	300	70	335	400	1,000,000		
	thick									
	2" to 4"									
	wide									
Construction Standard Utility	2" to 4"	700	800	400	70	335	750	1,000,000		
	thick	375	450	225	70	335	625	1,000,000		
	4" wide	175	200	100	70	335	400	1,000,000		
Select Structural	2" to 4"	1150	1350	775	70	335	925	1,200,000		
No. 1	thick	1000	1150	675	70	335	825	1,200,000		
No. 2	5" and wider	825	950	425	70	335	700	1,100,000		
No. 3		475	550	250	70	335	450	1,000,000		
Appearance Stud		1000	1150	675	70	335	1000	1,200,000		
Stud	2" to 4"	475	550	250	70	335	450	1,000,000		
	thick									
	5" and wider									
<b>EASTERN SPRUCE</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural	2" to 4"	1400	1600	800	70	390	1050	1,500,000	NELMA NHPMA (See footnotes 1-12 and 20)	
No. 1	thick	1200	1350	700	70	390	825	1,500,000		
No. 2	2" to 4"	975	1100	575	70	390	650	1,400,000		
No. 3	wide	550	625	325	70	390	400	1,200,000		
Appearance Stud		1200	1350	700	70	390	1000	1,500,000		
Construction Standard Utility	2" to 4"	700	800	400	70	390	750	1,200,000		
	thick	400	450	225	70	390	625	1,200,000		
	4" wide	175	225	100	70	390	400	1,200,000		
Select Structural	2" to 4"	1200	1350	800	70	390	925	1,500,000		
No. 1	thick	1000	1150	675	70	390	825	1,500,000		
No. 2	5" and wider	825	950	425	70	390	700	1,400,000		
No. 3		475	550	250	70	390	450	1,200,000		
Appearance Stud		1000	1150	675	70	390	1000	1,500,000		
Select Structural	Beams and Stringers	1050	—	725	65	390	750	1,400,000	NHMPA (See footnotes 1-12 and 20)	
No. 1		900	—	600	65	390	625	1,400,000		
Select Structural	Posts and Timbers	1000	—	675	65	390	775	1,400,000		
No. 1		800	—	550	65	390	675	1,400,000		
Select Structural	Beams and Stringers	1050	—	725	65	390	750	1,400,000	NELMA (See footnotes 1-12 and 20)	
No. 1		900	—	600	65	390	625	1,400,000		
Select Structural	Posts and Timbers	1000	—	675	65	390	775	1,400,000		
No. 1		450	—	300	65	390	300	1,000,000		
Select Commercial	Decking	—	1300	—	—	—	—	1,500,000		
		—	1100	—	—	—	—	1,400,000		

**TABLE 4A—DESIGN VALUES FOR VISUALLY GRADED STRUCTURAL LUMBER**

(Design values listed are for normal loading conditions. See other provisions in the footnotes and in the National Design Specification for adjustments of tabulated values.)

Species and commercial grade	Size classification	Design values in pounds per square inch							Grading rules agency	
		Extreme fiber in bending "F <sub>b</sub> "		Tension parallel to grain "F <sub>T</sub> "	Horizontal shear "F <sub>v</sub> "	Compression perpendicular to grain "F <sub>c</sub> ⊥"	Compression parallel to grain "F <sub>c</sub> "	Modulus of elasticity "E"		
		Single-member uses	Repetitive-member uses							
<b>EASTERN WHITE PINE</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural		1350	1550	800	70	350	1050	1,200,000	NELMA NHPMA  (See footnotes 1-12 and 20)	
No. 1	2" to 4"	1150	1350	675	70	350	850	1,200,000		
No. 2	thick	950	1100	550	70	350	675	1,100,000		
No. 3	2" to 4"	525	600	300	70	350	400	1,000,000		
Appearance Stud	wide	1150	1350	675	70	350	1000	1,200,000		
		525	600	300	70	350	400	1,000,000		
Construction Standard Utility	2" to 4" thick 4" wide	700	800	400	70	350	750	1,000,000		
		375	450	225	70	350	625	1,000,000		
		175	200	100	70	350	400	1,000,000		
Select Structural		1150	1350	775	70	350	950	1,200,000		
No. 1	2" to 4"	1000	1150	675	70	350	850	1,200,000		
No. 2	thick	825	950	425	70	350	700	1,100,000		
No. 3	5" and wider	475	550	250	70	350	450	1,000,000		
Appearance Stud		1000	1150	675	70	350	1000	1,200,000		
		475	550	250	70	350	450	1,000,000		
Select Structural	Beams and Stringers	1050	—	700	65	350	675	1,100,000	NHPMA (See footnotes 1-12 and 20)	
No. 1		875	—	600	65	350	575	1,100,000		
Select Structural	Posts and Timbers	975	—	650	65	350	725	1,100,000		
No. 1		800	—	525	65	350	625	1,100,000		
Select Structural	Beams and Stringers	1050	—	700	65	350	675	1,100,000	NELMA (See footnotes 1-12 and 20)	
No. 1		875	—	600	65	350	575	1,100,000		
No. 2		575	—	275	65	350	400	900,000		
Select Structural	Posts and Timbers	975	—	650	65	350	725	1,100,000		
No. 1		800	—	525	65	350	625	1,100,000		
No. 2		450	—	300	65	350	325	900,000		
Select Commercial	Decking	1150	1300	—	—	—	—	1,200,000		
		950	1100	—	—	—	—	1,100,000		
<b>EASTERN WHITE PINE (NORTH)</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural		1350	1550	800	65	350	1050	1,200,000	NLGA  (A Canadian agency. See footnotes 1-12, 15, 16 and 20)	
No. 1	2" to 3"	1150	1350	675	65	350	850	1,200,000		
No. 2	thick	950	1100	550	65	350	675	1,100,000		
No. 3	2" to 4"	525	600	300	65	350	400	1,000,000		
Appearance Stud	wide	1150	1350	675	65	350	1000	1,200,000		
		525	600	300	65	350	400	1,000,000		
Construction Standard Utility	2" to 4" thick 4" wide	700	800	400	65	350	750	1,000,000		
		375	450	225	65	350	625	1,000,000		
		175	200	100	65	350	400	1,000,000		
Select Structural		1150	1350	775	65	350	950	1,200,000		
No. 1	2" to 4"	1000	1150	675	65	350	850	1,200,000		
No. 2	thick	825	950	425	65	350	700	1,100,000		
No. 3	5" and wider	475	550	250	65	350	450	1,000,000		
Appearance Stud		1000	1150	675	65	350	1000	1,200,000		
		475	550	250	65	350	450	1,000,000		
Select Commercial	Decking	900	1050	—	—	350	—	1,200,000		
		775	875	—	—	350	—	1,100,000		
<b>EASTERN WOODS</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural		1300	1500	775	60	270	850	1,100,000	NELMA NHPMA  (See footnotes 1-12)	
No. 1	2" to 4"	1100	1300	650	60	270	675	1,100,000		
No. 2	thick	925	1050	525	60	270	550	1,000,000		
No. 3	2" to 4"	500	575	300	60	270	325	900,000		
Appearance Stud	wide	1100	1300	650	60	270	825	1,100,000		
		500	575	300	60	270	325	900,000		
Construction Standard Utility	2" to 4" thick 4" wide	650	750	400	60	270	625	900,000		
		375	425	225	60	270	500	900,000		
		175	200	100	60	270	325	900,000		
Select Structural		1150	1300	750	60	270	750	1,100,000		
No. 1	2" to 4"	950	1100	650	60	270	675	1,100,000		
No. 2	thick	775	900	425	60	270	575	1,000,000		
No. 3	5" and wider	450	525	250	60	270	375	900,000		
Appearance Stud		950	1100	650	60	270	825	1,100,000		
		450	525	250	60	270	375	900,000		
Select Commercial	Decking	900	1050	—	—	350	—	1,200,000	(See footnotes 1-12 and 20)	
		775	875	—	—	350	—	1,100,000		

**TABLE 4A—DESIGN VALUES FOR VISUALLY GRADED STRUCTURAL LUMBER**

(Design values listed are for normal loading conditions. See other provisions in the footnotes and in the National Design Specification for adjustments of tabulated values.)

Species and commercial grade	Size classification	Design values in pounds per square inch							Grading rules agency	
		Extreme fiber in bending "F <sub>B</sub> "		Tension parallel to grain "F <sub>T</sub> "	Horizontal shear "F <sub>V</sub> "	Compression perpendicular to grain "F <sub>C</sub> ⊥"	Compression parallel to grain "F <sub>C</sub> "	Modulus of elasticity "E"		
		Single-member uses	Repetitive-member uses							
<b>ENGELMANN SPRUCE—ALPINE FIR (ENGELMANN SPRUCE—LOGGEPOLE PINE)</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural		1350	1550	800	70	320	950	1,300,000	WWPA (See footnotes 1-13 and 20)	
No. 1	2" to 4"	1150	1350	675	70	320	750	1,300,000		
No. 2	thick	950	1100	550	70	320	600	1,100,000		
No. 3	2" to 4"	525	600	300	70	320	375	1,000,000		
Appearance Stud	wide	1150	1350	675	70	320	900	1,300,000		
		525	600	300	70	320	375	1,000,000		
Construction Standard Utility	2" to 4"	700	800	400	70	320	675	1,000,000		
	thick	375	450	225	70	320	550	1,000,000		
	4" wide	175	200	100	70	320	375	1,000,000		
Select Structural		1200	1350	775	70	320	850	1,300,000		
No. 1	2" to 4"	1000	1150	675	70	320	750	1,300,000		
No. 2	thick	825	950	425	70	320	625	1,100,000		
No. 3	5" and wider	475	550	250	70	320	400	1,000,000		
Appearance Stud		1000	1150	675	70	320	900	1,300,000		
		475	550	250	70	320	400	1,000,000		
Select Structural	Beams and Stringers	1050	—	700	65	320	675	1,100,000	WCLIB WWPA (See footnotes 1-12 and 20)	
No. 1		875	—	600	65	320	550	1,100,000		
No. 2		575	—	275	65	320	350	900,000		
Select Structural	Posts and Timbers	975	—	650	65	320	700	1,100,000		
No. 1		800	—	525	65	320	625	1,100,000		
No. 2		450	—	300	65	320	275	900,000		
Selected Decking Commercial Decking	Decking	—	1300	—	—	—	—	1,300,000		
		—	1100	—	—	—	—	1,100,000		
Selected Decking Commercial Decking	Decking	—	1400	(Surfaced at 15% max. m.c. and used at 15% max. m.c.)				1,300,000		
		—	1200					1,200,000		
<b>HEM-FIR</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural		1650	1900	975	75	405	1300	1,500,000	WCLIB WWPA (See footnotes 1-12 and 20)	
No. 1	2" to 4"	1400	1600	825	75	405	1050	1,500,000		
No. 2	thick	1150	1350	675	75	405	825	1,400,000		
No. 3	2" to 4"	650	725	375	75	405	500	1,200,000		
Appearance Stud	wide	1400	1600	825	75	405	1250	1,500,000		
		650	725	375	75	405	500	1,200,000		
Construction Standard Utility	2" to 4"	825	975	500	75	405	925	1,200,000		
	thick	475	550	275	75	405	775	1,200,000		
	4" wide	225	250	125	75	405	500	1,200,000		
Select Structural		1400	1650	950	75	405	1150	1,500,000		
No. 1	2" to 4"	1200	1400	800	75	405	1050	1,500,000		
No. 2	thick	1000	1150	525	75	405	875	1,400,000		
No. 3	5" and wider	575	675	300	75	405	550	1,200,000		
Appearance Stud		1200	1400	800	75	405	1250	1,500,000		
		575	675	300	75	405	550	1,200,000		
Select Structural	Beams and Stringers	1300	—	750	70	405	925	1,300,000	WCLIB (See footnotes 1-12 and 20)	
No. 1		1050	—	525	70	405	750	1,300,000		
No. 2		675	—	350	70	405	500	1,100,000		
Select Structural	Posts and Timbers	1200	—	800	70	405	975	1,300,000		
No. 1		975	—	650	70	405	850	1,300,000		
No. 2		575	—	375	70	405	575	1,100,000		
Select Dex Commercial Dex	Decking	1400	1600	—	—	405	—	1,500,000		
		1150	1350	—	—	405	—	1,400,000		
Select Structural	Beams and Stringers	1250	—	850	70	405	925	1,300,000	WWPA (See footnotes 1-13 and 20)	
No. 1		1050	—	725	70	405	775	1,300,000		
No. 2		675	—	325	70	405	475	1,100,000		
Select Structural	Posts and Timbers	1200	—	800	70	405	975	1,300,000		
No. 1		950	—	650	70	405	850	1,300,000		
No. 2		525	—	350	70	405	375	1,100,000		
Selected Decking Commercial Decking	Decking	—	1600	—	—	—	—	1,500,000		
		—	1350	—	—	—	—	1,400,000		
Selected Decking Commercial Decking	Decking	—	1700	(Surfaced at 15% max. m.c. and used at 15% max. m.c.)				1,600,000	(See footnotes 1-13 and 20)	
		—	1450					1,400,000		

**TABLE 4A—DESIGN VALUES FOR VISUALLY GRADED STRUCTURAL LUMBER**

(Design values listed are for normal loading conditions. See other provisions in the footnotes and in the National Design Specification for adjustments of tabulated values.)

Species and commercial grade	Size classification	Design values in pounds per square inch							Grading rules agency	
		Extreme fiber in bending "F <sub>B</sub> "		Tension parallel to grain "F <sub>T</sub> "	Horizontal shear "F <sub>V</sub> "	Compression perpendicular to grain "F <sub>C</sub> ⊥"	Compression parallel to grain "F <sub>C</sub> "	Modulus of elasticity "E"		
		Single-member uses	Repetitive-member uses							
<b>HEM-FIR (NORTH)</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural	1600	1800	925	75	370	1300	1,500,000		NLGA (A Canadian agency. See footnotes 1-12, 15, 16 and 20)	
No. 1	1350	1550	800	75	370	1050	1,500,000			
No. 2	1100	1300	650	75	370	800	1,400,000			
No. 3	625	700	350	75	370	500	1,200,000			
Appearance Stud	1350	1550	800	75	370	1250	1,500,000			
	625	700	350	75	370	500	1,200,000			
Construction Standard Utility	2" to 4" thick 4" wide	800 450 225	925 525 250	475 275 125	75 75 75	370 370 370	925 775 500	1,200,000 1,200,000 1,200,000		
Select Structural	1350	1550	900	75	370	1150	1,500,000			
No. 1	1150	1350	775	75	370	1050	1,500,000			
No. 2	950	1100	500	75	370	850	1,400,000			
No. 3	550	650	300	75	370	550	1,200,000			
Appearance Stud	1150	1350	775	75	370	1250	1,500,000			
	550	650	300	75	370	550	1,200,000			
Select Structural	Beams and Stringers	1250	—	725	70	370	900	1,300,000	WWPA (See footnotes 1-13 and 20)	
No. 1	1000	—	500	70	370	750	1,300,000			
No. 2	675	—	325	70	370	475	1,100,000			
Select Structural	Posts and Timbers	1150	—	775	70	370	950	1,300,000		
No. 1	925	—	625	70	370	850	1,300,000			
No. 2	550	—	375	70	370	575	1,100,000			
Select Commercial	Decking	1350	1500	—	—	370	—	1,500,000		
	1100	1300	—	—	—	370	—	1,400,000		
<b>IDAHO WHITE PINE</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural	1350	1550	775	70	315	1100	1,400,000		WWPA (See footnotes 1-13 and 20)	
No. 1	1150	1300	650	70	315	875	1,400,000			
No. 2	925	1050	550	70	315	675	1,300,000			
No. 3	525	600	300	70	315	425	1,200,000			
Appearance Stud	1150	1300	650	70	315	1050	1,400,000			
	525	600	300	70	315	425	1,200,000			
Construction Standard Utility	2" to 4" thick 4" wide	675 375 175	775 425 200	400 225 100	70 70 70	315 315 315	775 650 425	1,200,000 1,200,000 1,200,000		
Select Structural	1150	1300	775	70	315	950	1,400,000			
No. 1	975	1100	650	70	315	875	1,400,000			
No. 2	800	925	425	70	315	725	1,300,000			
No. 3	475	550	250	70	315	450	1,200,000			
Appearance Stud	975	1100	650	70	315	1050	1,400,000			
	475	550	250	70	315	450	1,200,000			
Select Structural	Beams and Stringers	1000	—	700	65	315	775	1,300,000		
No. 1	850	—	575	65	315	650	1,300,000			
No. 2	550	—	275	65	315	400	1,000,000			
Select Structural	Posts and Timbers	950	—	650	65	315	800	1,300,000		
No. 1	775	—	525	65	315	700	1,300,000			
No. 2	450	—	300	65	315	325	1,000,000			
Selected Decking Commercial Decking	Decking	—	1300	—	—	—	—	1,400,000		
	—	1050	—	—	—	—	—	1,300,000		
Selected Decking Commercial Decking	Decking	—	1400	(Surfaced at 15% max. m.c. and used at 15% max. m.c.)			—	1,500,000		
	—	1150	—				—	1,400,000		

**TABLE 4A—DESIGN VALUES FOR VISUALLY GRADED STRUCTURAL LUMBER**

(Design values listed are for normal loading conditions. See other provisions in the footnotes and in the National Design Specification for adjustments of tabulated values.)

Species and commercial grade	Size classification	Design values in pounds per square inch							Grading rules agency	
		Extreme fiber in bending "F <sub>B</sub> "		Tension parallel to grain "F <sub>T</sub> "	Horizontal shear "F <sub>V</sub> "	Compression perpendicular to grain "F <sub>C</sub> ⊥"	Compression parallel to grain "F <sub>C</sub> "	Modulus of elasticity "E"		
		Single-member uses	Repetitive-member uses							
<b>LOGPOLE PINE</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural		1500	1750	875	70	400	1150	1,300,000	WWPA  (See footnotes 1-13 and 20)	
No.-1	2" to 4"	1300	1500	750	70	400	900	1,300,000		
No. 2	thick	1050	1200	625	70	400	700	1,200,000		
No. 3	2" to 4"	600	675	350	70	400	425	1,000,000		
Appearance	wide	1300	1500	750	70	400	1050	1,300,000		
Stud		600	675	350	70	400	425	1,000,000		
Construction Standard Utility	2" to 4"	775	875	450	70	400	800	1,000,000		
	thick	425	500	250	70	400	675	1,000,000		
	4" wide	200	225	125	70	400	425	1,000,000		
Select Structural		1300	1500	875	70	400	1000	1,300,000		
No. 1	2" to 4"	1100	1300	750	70	400	900	1,300,000		
No. 2	thick	925	1050	475	70	400	750	1,200,000		
No. 3	5" and wider	525	625	275	70	400	475	1,000,000		
Appearance		1100	1300	750	70	400	1050	1,300,000		
Stud		525	625	275	70	400	475	1,000,000		
Select Structural	Beams and Stringers	1150	—	775	65	400	800	1,100,000	WCLIB  (See footnotes 1-13 and 20)	
No. 1		975	—	650	65	400	675	1,100,000		
No. 2		625	—	325	65	400	425	900,000		
Select Structural	Posts and Timbers	1100	—	725	65	400	850	1,100,000		
No. 1		875	—	600	65	400	725	1,100,000		
No. 2		500	—	350	65	400	350	900,000		
Selected Decking Commercial Decking	Decking	—	1450	—	—	—	—	1,300,000		
		—	1200	—	—	—	—	1,200,000		
Selected Decking Commercial Decking	Decking	—	1550	(Surfaced at 15% max. m.c. and used at 15% max. m.c.)				—	1,400,000	
		—	1300					—	1,200,000	
<b>MIXED SPECIES (WEST COAST WOODS)</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural		1350	1550	775	70	315	950	1,100,000	WCLIB  (See footnotes 1-13 and 20)	
No. 1	2" to 4"	1150	1300	650	70	315	750	1,100,000		
No. 2	thick	925	1050	550	70	315	600	1,000,000		
No. 3	2" to 4"	525	600	300	70	315	375	900,000		
Stud	wide	525	600	300	70	315	375	900,000		
Construction Standard Utility	2" to 4"	675	775	400	70	315	675	900,000		
	thick	375	425	225	70	315	550	900,000		
	4" wide	175	200	100	70	315	375	900,000		
Select Structural	2" to 4"	1150	1300	775	70	315	850	1,100,000		
No. 1	thick	975	1100	650	70	315	750	1,100,000		
No. 2	5" and wider	800	925	425	70	315	625	1,000,000		
No. 3	Stud	475	550	250	70	315	400	900,000		
		475	550	250	70	315	400	900,000		

**TABLE 4A—DESIGN VALUES FOR VISUALLY GRADED STRUCTURAL LUMBER**

(Design values listed are for normal loading conditions. See other provisions in the footnotes and in the National Design Specification for adjustments of tabulated values.)

Species and commercial grade	Size classification	Design values in pounds per square inch							Grading rules agency	
		Extreme fiber in bending "F <sub>B</sub> "		Tension parallel to grain "F <sub>T</sub> "	Horizontal shear "F <sub>V</sub> "	Compression perpendicular to grain "F <sub>C</sub> ⊥"	Compression parallel to grain "F <sub>C</sub> "	Modulus of elasticity "E"		
		Single-member uses	Repetitive-member uses							
<b>MOUNTAIN HEMLOCK</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural	2" to 4"	1750	2000	1000	95	570	1250	1,300,000	WCLIB WWPA  (See footnotes 1-12 and 20)	
No. 1	thick	1450	1700	850	95	570	1000	1,300,000		
No. 2	2" to 4"	1200	1400	700	95	570	775	1,100,000		
No. 3	wide	675	775	400	95	570	475	1,000,000		
Appearance Stud		1450	1700	850	95	570	1200	1,300,000		
Construction Standard Utility	2" to 4" 4" wide	875 500 225	1000 575 275	525 275 125	95 95 95	570 570 570	900 725 475	1,000,000 1,000,000 1,000,000		
Select Structural	2" to 4"	1500	1700	1000	95	570	1100	1,300,000		
No. 1	thick	1250	1450	850	95	570	1000	1,300,000		
No. 2	5" and wider	1050	1200	550	95	570	825	1,100,000		
No. 3		625	700	325	95	570	525	1,000,000		
Appearance Stud		1250	1450	850	95	570	1200	1,300,000		
Select Structural	Beams and Stringers	1350	—	775	85	570	875	1,100,000	WCLIB  (See footnotes 1-12 and 20)	
No. 1		1100	—	550	85	570	725	1,100,000		
No. 2		725	—	375	85	570	475	900,000		
Select Structural	Posts and Timbers	1250	—	825	85	570	925	1,100,000		
No. 1		1000	—	675	85	570	800	1,100,000		
No. 2		625	—	400	85	570	550	900,000		
Select Dex Commercial Dex	Decking	1450	1650	—	—	570	—	1,300,000		
		1200	1400	—	—	570	—	1,100,000		
Select Structural	Beams and Stringers	1350	—	900	90	570	875	1,100,000	WWPA  (See footnotes 1-13 and 20)	
No. 1		1100	—	750	90	570	750	1,100,000		
No. 2		725	—	375	90	570	475	900,000		
Select Structural	Posts and Timbers	1250	—	825	90	570	925	1,100,000		
No. 1		1000	—	675	90	570	800	1,100,000		
No. 2		575	—	375	90	570	375	900,000		
Selected Decking Commercial Decking	Decking	—	1650	—	—	—	—	1,300,000		
Selected Decking Commercial Decking	Decking	—	1800	(Surfaced at 15% max. m.c. and used at 15% max. m.c.)				1,300,000		
		—	1500					1,200,000		

**TABLE 4A—DESIGN VALUES FOR VISUALLY GRADED STRUCTURAL LUMBER**

(Design values listed are for normal loading conditions. See other provisions in the footnotes and in the National Design Specification for adjustments of tabulated values.)

Species and commercial grade	Size classification	Design values in pounds per square inch							Grading rules agency	
		Extreme fiber in bending "F <sub>b</sub> "		Tension parallel to grain "F <sub>T</sub> "	Horizontal shear "F <sub>V</sub> "	Compression perpendicular to grain "F <sub>C</sub> ⊥"	Compression parallel to grain "F <sub>C</sub> "	Modulus of elasticity "E"		
		Single-member uses	Repetitive-member uses							
<b>MOUNTAIN HEMLOCK—HEM-FIR</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural										
No. 1	2" to 4"	1650	1900	975	75	405	1250	1,300,000	WWPA  (See footnotes 1-13 and 20)	
No. 2	thick	1400	1600	825	75	405	1000	1,300,000		
No. 3	2" to 4"	1150	1350	675	75	405	775	1,100,000		
Appearance Stud	wide	650	725	375	75	405	475	1,000,000		
Construction Standard Utility	2" to 4" 4" wide	825 475 225	975 550 250	500 275 125	75 75 75	405 405 405	900 725 475	1,000,000 1,000,000 1,000,000		
Select Structural										
No. 1	2" to 4"	1400	1650	950	75	405	1100	1,300,000		
No. 2	thick	1200	1400	800	75	405	1000	1,300,000		
No. 3	5" and wider	1000 575	1150 675	525 300	75	405	825 525	1,100,000 1,000,000		
Appearance Stud		1200 575	1400 675	800 300	75	405	1200 525	1,300,000 1,000,000		
Select Structural	Beams and Stringers	1250	—	850	70	405	875	1,100,000		
No. 1		1050	—	725	70	405	750	1,100,000		
No. 2		675	—	325	70	405	475	900,000		
Select Structural	Posts and Timbers	1200	—	800	70	405	925	1,100,000		
No. 1		950	—	650	70	405	800	1,100,000		
No. 2		525	—	350	70	405	375	900,000		
Selected Decking Commercial Decking	Decking	—	1600	—	—	—	—	1,300,000		
Selected Decking Commercial Decking	Decking	—	1700	(Surfaced at 15% max. m.c. and used at 15% max. m.c.)				—	1,300,000	
—	—	1450	—					—	1,200,000	
<b>NORTHERN ASPEN</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural										
No. 1	2" to 3"	1300	1500	750	60	320	850	1,400,000	NLGA  (A Canadian agency. See footnotes 1-12, 15, 16 and 20)	
No. 2	thick	1100	1250	650	60	320	675	1,400,000		
No. 3	2" to 4"	900	1050	525	60	320	525	1,200,000		
Appearance Stud	wide	500	575	275	60	320	325	1,100,000		
1100	1250	650	60	320	800	1,400,000				
500	575	275	60	320	325	1,100,000				
Construction Standard Utility	2" to 4" 4" wide	650 350 175	750 425 200	375 200 100	60 60 60	320 320 320	600 500 325	1,100,000 1,100,000 1,100,000		
Select Structural										
No. 1	2" to 4"	1100	1250	725	60	320	750	1,400,000		
No. 2	thick	950	1100	625	60	320	675	1,400,000		
No. 3	5" and wider	775	900	400	60	320	575	1,200,000		
Appearance Stud		450 950	525 1100	250 625	60	320	350 800	1,100,000 1,400,000		
450	525	250	60	320	320	350	350	1,100,000		
<b>NORTHERN PINE</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural										
No. 1	2" to 4"	1650	1850	950	70	435	1200	1,400,000	NELMA  NHPMA  (See footnotes 1-12 and 20)	
No. 2	thick	1400	1600	825	70	435	975	1,400,000		
No. 3	2" to 4"	1150	1300	675	70	435	775	1,300,000		
Appearance Stud	wide	625	725	375	70	435	475	1,100,000		
1200	1400	800	70	435	1150	1,400,000				
625	725	375	70	435	475	1,100,000				
Construction Standard Utility	2" to 4" 4" wide	825 450 225	950 525 250	475 275 125	70	435	875 725 475	1,100,000 1,100,000 1,100,000		
Select Structural										
No. 1	2" to 4"	1400	1600	950	70	435	1100	1,400,000		
No. 2	thick	1200	1400	800	70	435	975	1,400,000		
No. 3	5" and wider	950	1100	525	70	435	825	1,300,000		
Appearance Stud		575	650	300	70	435	525	1,100,000		
1200	1400	800	70	435	1150	1,400,000				
575	650	300	70	435	525	1,100,000				
Select Structural	Beams and Stringers	1250	—	850	65	435	850	1,300,000	NHPMA  (See footnotes 1-12 and 20)	
No. 1		1050	—	700	65	435	725	1,300,000		
Select Structural	Posts and Timbers	1150	—	800	65	435	900	1,300,000		
No. 1		950	—	650	65	435	800	1,300,000		
Select Structural	Beams and Stringers	1250	—	850	65	435	850	1,300,000		
No. 1		1050	—	700	65	435	725	1,300,000	NELMA  (See footnotes 1-12 and 20)	
No. 2		675	—	350	65	435	450	1,000,000		
Select Structural	Posts and Timbers	1150	—	800	65	435	900	1,300,000		
No. 1		950	—	650	65	435	800	1,300,000		
Select Structural	Decking	1350	1550	—	—	—	—	1,400,000	NELMA  (See footnotes 1-12 and 20)	
Commercial		1150	1300	—	—	—	—	1,300,000		

**TABLE 4A—DESIGN VALUES FOR VISUALLY GRADED STRUCTURAL LUMBER**

(Design values listed are for normal loading conditions. See other provisions in the footnotes and in the National Design Specification for adjustments of tabulated values.)

Species and commercial grade	Size classification	Design values in pounds per square inch							Grading rules agency	
		Extreme fiber in bending "F <sub>B</sub> "		Tension parallel to grain "F <sub>T</sub> "	Horizontal shear "F <sub>V</sub> "	Compression perpendicular to grain "F <sub>C</sub> ⊥"	Compression parallel to grain "F <sub>C</sub> "	Modulus of elasticity "E"		
		Single-member uses	Repetitive-member uses							
<b>NORTHERN SPECIES</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural	1350	1550	775	65	350	1050	1,100,000		NLGA          	
No. 1	2" to 3"	1150	1300	675	65	350	825	1,100,000		
No. 2	thick	925	1050	550	65	350	650	1,000,000		
No. 3	2" to 4"	525	600	300	65	350	400	900,000		
Appearance Stud	wide	1150	1300	675	65	350	975	1,100,000		
		525	600	300	65	350	400	900,000		
Construction Standard Utility	2" to 4"	675	775	400	65	350	750	900,000		
	thick	375	425	225	65	350	600	900,000		
	4" wide	175	200	100	65	350	400	900,000		
Select Structural	1150	1300	750	65	350	900	1,100,000			
No. 1	2" to 4"	975	1150	650	65	350	825	1,100,000		
No. 2	thick	800	925	425	65	350	675	1,000,000		
No. 3	5" and wider	475	550	250	65	350	425	900,000		
Appearance Stud		975	1150	650	65	350	975	1,100,000		
		475	550	250	65	350	425	900,000		
Select Commercial	Decking	900	1050	—	—	350	—	1,100,000	(A Canadian agency. See footnotes 1-12, 15, 16 and 20)	
		775	875	—	—	350	—	1,000,000		
<b>NORTHERN WHITE CEDAR</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural	1150	1350	700	65	370	875	800,000	NELMA          		
No. 1	2" to 4"	1000	1150	600	65	370	675	800,000		
No. 2	thick	825	950	500	65	370	550	700,000		
No. 3	2" to 4"	450	525	275	65	370	325	600,000		
Appearance Stud	wide	850	1000	575	65	370	825	800,000		
		450	525	275	65	370	325	600,000		
Construction Standard Utility	2" to 4"	600	675	350	65	370	625	600,000		
	thick	325	375	200	65	370	500	600,000		
	4" wide	150	175	100	65	370	325	600,000		
Select Structural	1000	1150	675	65	370	775	800,000			
No. 1	2" to 4"	850	1000	575	65	370	675	800,000		
No. 2	thick	700	825	375	65	370	575	700,000		
No. 3	5" and wider	425	475	225	65	370	375	600,000		
Appearance Stud		850	1000	575	65	370	825	800,000		
		425	475	225	65	370	375	600,000		
Select Structural	Beams and Stringers	900	—	600	60	370	600	700,000	(See footnotes 1-12 and 20)	
No. 1		750	—	500	60	370	500	700,000		
No. 2		500	—	250	60	370	325	600,000		
Select Structural	Posts and Timbers	850	—	575	60	370	650	700,000		
No. 1		675	—	450	60	370	550	700,000		
No. 2		400	—	250	60	370	250	600,000		
Select Commercial	Decking	975	1100	—	—	—	—	800,000		
		825	950	—	—	—	—	700,000		
<b>PONDEROSA PINE</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural	1400	1650	825	70	535	1050	1,200,000	NLGA          		
No. 1	2" to 3"	1200	1400	700	70	535	850	1,200,000		
No. 2	thick	1000	1150	575	70	535	675	1,100,000		
No. 3	2" to 4"	550	625	325	70	535	400	1,000,000		
Appearance Stud	wide	1200	1400	700	70	535	1000	1,200,000		
		550	625	325	70	535	400	1,000,000		
Construction Standard Utility	2" to 4"	725	825	425	70	535	775	1,000,000		
	thick	400	450	225	70	535	625	1,000,000		
	4" wide	200	225	100	70	535	400	1,000,000		
Select Structural	1200	1400	825	70	535	950	1,200,000			
No. 1	2" to 4"	1050	1200	700	70	535	850	1,200,000		
No. 2	thick	850	975	450	70	535	700	1,100,000		
No. 3	5" and wider	500	575	250	70	535	450	1,000,000		
Appearance Stud		1050	1200	700	70	535	1000	1,200,000		
		500	575	250	70	535	450	1,000,000		
Select Structural	Beams and Stringers	1100	—	725	65	535	750	1,100,000	(A Canadian agency. See footnotes 1-12, 15, 16 and 20)	
No. 1		925	—	500	65	535	625	1,100,000		
No. 2		600	—	300	65	535	400	900,000		
Select Structural	Posts and Timbers	1000	—	675	65	535	800	1,100,000		
No. 1		825	—	550	65	535	700	1,100,000		
No. 2		475	—	325	65	535	325	900,000		
Select Commercial	Decking	1200	1450	—	—	535	—	1,300,000		
		1000	1250	—	—	535	—	1,100,000		

**TABLE 4A—DESIGN VALUES FOR VISUALLY GRADED STRUCTURAL LUMBER**

(Design values listed are for normal loading conditions. See other provisions in the footnotes and in the National Design Specification for adjustments of tabulated values.)

Species and commercial grade	Size classification	Design values in pounds per square inch							Grading rules agency	
		Extreme fiber in bending "F <sub>B</sub> "		Tension parallel to grain "F <sub>T</sub> "	Horizontal shear "F <sub>V</sub> "	Compression perpendicular to grain "F <sub>C</sub> ⊥"	Compression parallel to grain "F <sub>C</sub> "	Modulus of elasticity "E"		
		Single-member uses	Repetitive-member uses							
<b>PONDEROSA PINE—SUGAR PINE (PONDEROSA PINE—LOGEPOLE PINE)</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural	2" to 4"	1400	1650	825	70	375	1050	1,200,000	WWPA  (See footnotes 1–13 and 20)	
No. 1	thick	1200	1400	700	70	375	850	1,200,000		
No. 2	2" to 4"	1000	1150	575	70	375	675	1,100,000		
No. 3	wide	550	625	325	70	375	400	1,000,000		
Appearance Stud		1200	1400	700	70	375	1000	1,200,000		
		550	625	325	70	375	400	1,000,000		
Construction Standard Utility	2" to 4" thick 4" wide	725	825	425	70	375	775	1,000,000		
		400	450	225	70	375	625	1,000,000		
		200	225	100	70	375	400	1,000,000		
Select Structural	2" to 4"	1200	1400	825	70	375	950	1,200,000		
No. 1	thick	1050	1200	700	70	375	850	1,200,000		
No. 2	5" and wider	850	975	450	70	375	700	1,100,000		
No. 3		500	575	250	70	375	450	1,000,000		
Appearance Stud		1050	1200	700	70	375	1000	1,200,000		
		500	575	250	70	375	450	1,000,000		
Select Structural	Beams and Stringers	1100	—	725	65	375	750	1,100,000		
No. 1		925	—	625	65	375	625	1,100,000		
No. 2		600	—	300	65	375	400	900,000		
Select Structural	Posts and Timbers	1000	—	675	65	375	800	1,100,000		
No. 1		825	—	550	65	375	700	1,100,000		
No. 2		475	—	325	65	375	325	900,000		
Selected Decking Commercial Decking	Decking	—	1350	—	—	—	—	1,200,000		
		—	1150	—	—	—	—	1,100,000		
Selected Decking Commercial Decking	Decking	—	1450	(Surfaced at 15% max. m.c. and used at 15% max. m.c.)			—	1,300,000		
		—	1250				—	1,100,000		
<b>RED PINE</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural	2" to 3"	1400	1600	800	70	440	1050	1,300,000	NLGA  (A Canadian agency. See footnotes 1–12, 15, 16 and 20)	
No. 1	thick	1200	1350	700	70	440	825	1,300,000		
No. 2	2" to 4"	975	1100	575	70	440	650	1,200,000		
No. 3	wide	525	625	325	70	440	400	1,000,000		
Appearance Stud		1200	1350	700	70	440	975	1,300,000		
		525	625	325	70	440	400	1,000,000		
Construction Standard Utility	2" to 4" thick 4" wide	700	800	400	70	440	750	1,000,000		
		400	450	225	70	440	600	1,000,000		
		175	225	100	70	440	400	1,000,000		
Select Structural	2" to 4"	1200	1350	775	70	440	900	1,300,000		
No. 1	thick	1000	1150	675	70	440	825	1,300,000		
No. 2	5" and wider	825	950	425	70	440	675	1,200,000		
No. 3		500	550	250	70	440	425	1,000,000		
Appearance Stud		1000	1150	675	70	440	975	1,300,000		
		500	550	250	70	440	425	1,000,000		
Select Structural	Beams and Stringers	1050	—	625	65	440	725	1,100,000		
No. 1		875	—	450	65	440	600	1,100,000		
No. 2		575	—	300	65	440	375	900,000		
Select Structural	Posts and Timbers	1000	—	675	65	440	775	1,100,000		
No. 1		800	—	550	65	440	675	1,100,000		
No. 2		475	—	325	65	440	475	900,000		
Select Commercial	Decking	1150	1350	—	—	440	—	1,300,000		
		975	1100	—	—	440	—	1,200,000		
<b>SITKA SPRUCE</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural	2" to 4"	1550	1800	925	75	435	1150	1,500,000	WCLB  (See footnotes 1–12 and 20)	
No. 1	thick	1350	1550	775	75	435	925	1,500,000		
No. 2	2" to 4"	1100	1250	650	75	435	725	1,300,000		
No. 3	wide	600	700	350	75	435	450	1,200,000		
Appearance Stud		1350	1550	750	75	435	1100	1,500,000		
		600	700	350	75	435	450	1,200,000		
Construction Standard Utility	2" to 4" thick 4" wide	800	925	475	75	435	825	1,200,000		
		450	500	250	75	435	675	1,200,000		
		200	250	125	75	435	450	1,200,000		
Select Structural	2" to 4"	1350	1550	900	75	435	1000	1,500,000		
No. 1	thick	1150	1300	775	75	435	925	1,500,000		
No. 2	5" and wider	925	1050	500	75	435	775	1,300,000		
No. 3		525	600	275	75	435	500	1,200,000		
Appearance Stud		1150	1300	750	75	435	1100	1,500,000		
		525	600	275	75	435	500	1,200,000		
Select Structural	Beams and Stringers	1200	—	675	70	435	825	1,300,000		
No. 1		1000	—	500	70	435	675	1,300,000		
No. 2		650	—	325	70	435	450	1,000,000		
Select Structural	Posts and Timbers	1150	—	750	70	435	875	1,300,000		
No. 1		925	—	600	70	435	750	1,300,000		
No. 2		550	—	350	70	435	525	1,000,000		
Select Dex Commercial Dex	Decking	1300	1500	—	—	435	—	1,500,000		
		1100	1250	—	—	435	—	1,300,000		

**TABLE 4A—DESIGN VALUES FOR VISUALLY GRADED STRUCTURAL LUMBER**

(Design values listed are for normal loading conditions. See other provisions in the footnotes and in the National Design Specification for adjustments of tabulated values.)

Species and commercial grade	Size classification	Design values in pounds per square inch							Grading rules agency	
		Extreme fiber in bending "F <sub>B</sub> "		Tension parallel to grain "F <sub>T</sub> "	Horizontal shear "F <sub>V</sub> "	Compression perpendicular to grain "F <sub>C</sub> ⊥"	Compression parallel to grain "F <sub>C</sub> "	Modulus of elasticity "E"		
		Single-member uses	Repetitive-member uses							
<b>SOUTHERN PINE</b> (Surfaced at 15% maximum moisture content, K.D.-15. Used at 15% max. m.c.)										
Select Structural		2150	2500	1250	105	565	1800	1,800,000	SPIB          	
Dense Select Structural		2500	2900	1500	105	660	2100	1,900,000		
No. 1		1850	2100	1050	105	565	1450	1,800,000		
No. 1 Dense	2" to 4" thick	2150	2450	1250	105	660	1700	1,900,000		
No. 2	2" to 4" wide	1550	1750	900	95	565	1150	1,600,000		
No. 2 Dense		1800	2050	1050	95	660	1350	1,700,000		
No. 3		850	975	500	95	565	675	1,500,000		
No. 3 Dense		1000	1150	575	95	660	800	1,500,000		
Stud		850	975	500	95	565	675	1,500,000		
Construction Standard Utility	2" to 4" 4" wide	1100	1250	650	105	565	1300	1,500,000		
		625	725	375	95	565	1050	1,500,000		
		275	300	175	95	565	675	1,500,000		
Select Structural		1850	2150	1200	95	565	1600	1,800,000	(See footnotes 1, 3, 4, 5, 6, 11, 12, 17, 18, 19, and 20)	
Dense Select Structural		2200	2500	1450	95	660	1850	1,900,000		
No. 1		1600	1850	1050	95	565	1450	1,800,000		
No. 1 Dense	2" to 4" thick	1850	2150	1250	95	660	1700	1,900,000		
No. 2	5" and wider	1300	1500	675	95	565	1200	1,600,000		
No. 2 Dense		1550	1750	800	95	660	1400	1,700,000		
No. 3		750	875	400	95	565	725	1,500,000		
No. 3 Dense		875	1000	450	95	660	850	1,500,000		
Stud		800	900	400	95	565	725	1,500,000		
Dense Standard Decking	2" to 4" thick	2150	2450	—	—	660	—	1,900,000		
Select Decking		1550	1750	—	—	565	—	1,600,000		
Dense Select Decking	2" and wider	1800	2050	—	—	660	—	1,700,000		
Commercial Decking		1550	1750	—	—	565	—	1,600,000		
Dense Commercial Decking	Decking	1800	2050	—	—	660	—	1,700,000		
Dense Structural 86	2" to 4" thick	2800	3250	1900	165	660	2300	1,900,000	SPIB          	
Dense Structural 72		2400	2750	1600	135	660	1950	1,900,000		
Dense Structural 65		2150	2450	1450	125	660	1750	1,900,000		
<b>SOUTHERN PINE</b> (Surfaced dry. Used at 19% max. m.c.)										
Select Structural		2000	2300	1150	100	565	1550	1,700,000		
Dense Select Structural		2350	2700	1350	100	660	1800	1,800,000		
No. 1		1700	1950	1000	100	565	1250	1,700,000		
No. 1 Dense	2" to 4" thick	2000	2300	1150	100	660	1450	1,800,000		
No. 2	2" to 4" wide	1400	1650	825	90	565	975	1,600,000		
No. 2 Dense		1650	1900	975	90	660	1150	1,600,000		
No. 3		775	900	450	90	565	575	1,400,000		
No. 3 Dense		925	1050	525	90	660	675	1,500,000		
Stud		775	900	450	90	565	575	1,400,000		
Construction Standard Utility	2" to 4" 4" wide	1000	1150	600	100	565	1100	1,400,000		
		575	675	350	90	565	900	1,400,000		
		275	300	150	90	565	575	1,400,000		
Select Structural		1750	2000	1150	90	565	1350	1,700,000	(See footnotes 1,3,4,5,6,11,12, 17,18,19 and 20)	
Dense Select Structural		2050	2350	1300	90	660	1600	1,800,000		
No. 1		1450	1700	975	90	565	1250	1,700,000		
No. 1 Dense	2" to 4" thick	1700	2000	1150	90	660	1450	1,800,000		
No. 2	5" and wider	1200	1400	625	90	565	1000	1,600,000		
No. 2 Dense		1400	1650	725	90	660	1200	1,600,000		
No. 3		700	800	350	90	565	625	1,400,000		
No. 3 Dense		825	925	425	90	660	725	1,500,000		
Stud		725	850	350	90	565	625	1,400,000		
Dense Standard Decking	2" to 4" thick	2000	2300	—	—	660	—	1,800,000		
Select Decking		1400	1650	—	—	565	—	1,600,000		
Dense Select Decking	2" and wider	1650	1900	—	—	660	—	1,600,000		
Commercial Decking		1400	1650	—	—	565	—	1,600,000		
Dense Commercial Decking	Decking	1650	1900	—	—	660	—	1,600,000		
Dense Structural 86	2" to 4" thick	2600	3000	1750	155	660	2000	1,800,000		
Dense Structural 72		2200	2550	1450	130	660	1650	1,800,000		
Dense Structural 65		2000	2300	1300	115	660	1500	1,800,000		

**TABLE 4A—DESIGN VALUES FOR VISUALLY GRADED STRUCTURAL LUMBER**

(Design values listed are for normal loading conditions. See other provisions in the footnotes and in the National Design Specification for adjustments of tabulated values.)

Species and commercial grade	Size classification	Design values in pounds per square inch							Grading rules agency	
		Extreme fiber in bending "F <sub>b</sub> "		Tension parallel to grain "F <sub>T</sub> "	Horizontal shear "F <sub>V</sub> "	Compression perpendicular to grain "F <sub>c</sub> ⊥"	Compression parallel to grain "F <sub>c</sub> "	Modulus of elasticity "E"		
		Single-member uses	Repetitive-member uses							
<b>SOUTHERN PINE</b> (Surfaced green. Used any condition)										
Select Structural		1600	1850	925	95	375	1050	1,500,000	SPIB  (See footnotes 1,3,4,5,6,11,12, 17,18,19 and 20)	
Dense Select Structural		1850	2150	1100	95	440	1200	1,600,000		
No. 1		1350	1550	800	95	375	825	1,500,000		
No. 1 Dense	2½" to 4"	1600	1800	925	95	440	950	1,600,000		
No. 2	thick	1150	1300	675	85	375	650	1,400,000		
No. 2 Dense	2½" to 4"	1350	1500	775	85	440	750	1,400,000		
No. 3	wide	625	725	375	85	375	400	1,200,000		
No. 3 Dense		725	850	425	85	440	450	1,300,000		
Stud		625	725	375	85	375	400	1,200,000		
Construction Standard Utility	2½" to 4"	825	925	475	95	375	725	1,200,000		
	thick	475	525	275	85	375	600	1,200,000		
	4" wide	200	250	125	85	375	400	1,200,000		
Select Structural		1400	1600	900	85	375	900	1,500,000		
Dense Select Structural		1600	1850	1050	85	440	1050	1,600,000		
No. 1		1200	1350	775	85	375	825	1,500,000		
No. 1 Dense	2½" to 4"	1400	1600	925	85	440	950	1,600,000		
No. 2	thick	975	1100	500	85	375	675	1,400,000		
No. 2 Dense	5" and wider	1150	1300	600	85	440	800	1,400,000		
No. 3		550	650	300	85	375	425	1,200,000		
No. 3 Dense		650	750	350	85	440	475	1,300,000		
Stud		575	675	300	85	375	425	1,200,000		
Dense Standard Decking	2½" to 4"	1600	1800	—	—	440	—	1,600,000	NLGA  (A Canadian agency. See footnotes 1-12, 15, 16 and 20)	
Select Decking	thick	1150	1300	—	—	375	—	1,400,000		
Dense Select Decking	2" and wider	1350	1500	—	—	440	—	1,400,000		
Commercial Decking	1150	1300	—	—	375	—	1,400,000			
Dense Commercial Decking	Decking	1350	1500	—	—	440	—	1,400,000		
No. 1 SR		1350	—	875	110	375	775	1,500,000		
No. 1 Dense SR	5" and thicker	1550	—	1050	110	440	925	1,600,000		
No. 2 SR		1100	—	725	95	375	625	1,400,000		
No. 2 Dense SR		1250	—	850	95	440	725	1,400,000		
Dense Structural 86	2½" and thicker	2100	2400	1400	145	440	1300	1,600,000		
Dense Structural 72		1750	2050	1200	120	440	1100	1,600,000		
Dense Structural 65		1600	1800	1050	110	440	1000	1,600,000		
<b>SPRUCE—PINE—FIR</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural		1450	1650	850	70	425	1100	1,500,000	NLGA  (A Canadian agency. See footnotes 1-12, 15, 16 and 20)	
No. 1	2" to 3"	1200	1400	725	70	425	875	1,500,000		
No. 2	thick	1000	1150	600	70	425	675	1,300,000		
No. 3	2" to 4"	550	650	325	70	425	425	1,200,000		
Appearance Stud	wide	1200	1400	725	70	425	1050	1,500,000		
		550	650	325	70	425	425	1,200,000		
Construction Standard Utility	2" to 4"	725	850	425	70	425	775	1,200,000		
	thick	400	475	225	70	425	650	1,200,000		
	4" wide	175	225	100	70	425	425	1,200,000		
Select Structural		1250	1450	825	70	425	975	1,500,000		
No. 1	2" to 4"	1050	1200	700	70	425	875	1,500,000		
No. 2	thick	875	1000	450	70	425	725	1,300,000		
No. 3	5" and wider	500	575	275	70	425	450	1,200,000		
Appearance Stud		1050	1200	700	70	425	1050	1,500,000		
		500	575	275	70	425	450	1,200,000		
Select Structural	Beams and Stringers	1100	—	650	65	425	775	1,300,000		
No. 1		900	—	450	65	425	625	1,300,000		
No. 2		600	—	300	65	425	425	1,000,000		
Select Structural	Posts and Timbers	1050	—	700	65	425	800	1,300,000		
No. 1		850	—	550	65	425	700	1,300,000		
No. 2		500	—	325	65	425	500	1,000,000		
Select	Decking	1200	1400	—	—	425	—	1,500,000		
Commercial		1000	1150	—	—	425	—	1,300,000		
<b>VIRGINIA PINE—POND PINE</b> (Surfaced at 15% maximum moisture content, K.D.-15. Used at 15% max. m.c.)										
Select Structural	2" to 4"	2150	2500	1250	105	565	1750	1,600,000	SPIB  (See footnotes 1,3,4,5,6, 12,14,18, 19 and 20)	
No. 1	thick	1850	2150	1050	105	565	1400	1,600,000		
No. 2	2" to 4"	1550	1800	900	95	565	1100	1,400,000		
No. 3	wide	850	975	500	95	565	650	1,200,000		
Stud		850	975	500	95	565	650	1,200,000		
Construction Standard Utility	2" to 4"	1100	1300	650	105	565	1250	1,200,000		
	thick	625	725	375	95	565	1000	1,200,000		
	4" wide	275	325	175	95	565	650	1,200,000		
Select Structural	2" to 4"	1850	2150	1200	95	565	1500	1,600,000		
No. 1	thick	1600	1850	1050	95	565	1400	1,600,000		
No. 2	5" and wider	1300	1500	675	95	565	1150	1,400,000		
No. 3		750	875	400	95	565	700	1,200,000		
Stud		800	925	400	95	565	700	1,200,000		

**TABLE 4A—DESIGN VALUES FOR VISUALLY GRADED STRUCTURAL LUMBER**

(Design values listed are for normal loading conditions. See other provisions in the footnotes and in the National Design Specification for adjustments of tabulated values.)

Species and commercial grade	Size classification	Design values in pounds per square inch							Grading rules agency	
		Extreme fiber in bending "F <sub>B</sub> "		Tension parallel to grain "F <sub>T</sub> "	Horizontal shear "F <sub>V</sub> "	Compression perpendicular to grain "F <sub>C</sub> ⊥"	Compression parallel to grain "F <sub>C</sub> "	Modulus of elasticity "E"		
		Single-member uses	Repetitive-member uses							
<b>VIRGINIA PINE—POND PINE</b> (Surfaced dry. Used at 19% max. m.c.)										
Select Structural	2" to 4"	2000	2300	1150	100	565	1500	1,500,000	SPIB (See footnotes 1,3,4,5,6, 12,14,18, 19 and 20)	
No. 1	thick	1700	1950	1000	100	565	1200	1,500,000		
No. 2	2" to 4"	1400	1650	825	90	565	950	1,300,000		
No. 3	wide	775	900	450	90	565	575	1,200,000		
Stud		775	900	450	90	565	575	1,200,000		
Construction	2" to 4"	1000	1200	600	100	565	1050	1,200,000		
Standard	thick	575	675	350	90	565	850	1,200,000		
Utility	4" wide	275	300	150	90	565	575	1,200,000		
Select Structural	2" to 4"	1750	2000	See Footnote 3 1150	90	565	1300	1,500,000		
No. 1	thick	1450	1700	975	90	565	1200	1,500,000		
No. 2	5" and wider	1200	1400	625	90	565	975	1,300,000		
No. 3		700	800	350	90	565	600	1,200,000		
Stud		725	850	350	90	565	600	1,200,000		
<b>VIRGINIA PINE—POND PINE</b> (Surfaced green. Used any condition)										
Select Structural	2" to 4"	1600	1850	925	95	375	1000	1,300,000	SPIB (See footnotes 1,3,4,5,6, 12,14,18, 19 and 20)	
No. 1	thick	1350	1550	800	95	375	800	1,300,000		
No. 2	2" to 4"	1150	1300	675	85	375	625	1,200,000		
No. 3	wide	625	725	375	85	375	375	1,000,000		
Stud		625	725	375	85	375	375	1,000,000		
Construction	2" to 4"	825	950	475	95	375	700	1,000,000		
Standard	thick	475	550	275	85	375	575	1,000,000		
Utility	4" wide	200	250	125	85	375	375	1,000,000		
Select Structural	2" to 4"	1400	1600	900	85	375	875	1,300,000		
No. 1	thick	1200	1350	775	85	375	800	1,300,000		
No. 2	5" and wider	975	1100	500	85	375	650	1,200,000		
No. 3		550	650	300	85	375	400	1,000,000		
Stud		575	675	300	85	375	400	1,000,000		
<b>WESTERN CEDARS</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural		1500	1750	875	75	425	1200	1,100,000	WCLIB WWPA (See footnotes 1-12 and 20)	
No. 1	2" to 4"	1300	1500	750	75	425	950	1,100,000		
No. 2	thick	1050	1200	625	75	425	750	1,000,000		
No. 3	2" to 4"	600	675	350	75	425	450	900,000		
Appearance Stud	wide	1300	1500	750	75	425	1100	1,100,000		
600		675	350	75	425	450	900,000			
Construction	2" to 4"	775	875	450	75	425	850	900,000		
Standard	thick	425	500	250	75	425	700	900,000		
Utility	4" wide	200	225	125	75	425	450	900,000		
Select Structural		1300	1500	875	75	425	1050	1,100,000		
No. 1	2" to 4"	1100	1300	750	75	425	950	1,100,000		
No. 2	thick	925	1050	475	75	425	800	1,000,000		
No. 3	5" and wider	525	625	275	75	425	500	900,000		
Appearance Stud		1100	1300	750	75	425	1100	1,100,000		
525		625	275	75	425	500	900,000			
Select Structural	Beams and Stringers	1150	—	675	70	425	875	1,000,000	WCLIB (See footnotes 1-12 and 20)	
No. 1		975	—	475	70	425	725	1,000,000		
No. 2		625	—	325	70	425	475	800,000		
Select Structural	Posts and Timbers	1100	—	725	70	425	925	1,000,000		
No. 1		875	—	600	70	425	800	1,000,000		
No. 2		550	—	350	70	425	550	800,000		
Select Dex	Decking	1250	1450	—	—	425	—	1,100,000		
Commercial Dex		1050	1200	—	—	425	—	1,000,000		
Select Structural	Beams and Stringers	1150	—	775	70	425	875	1,000,000	WWPA (See footnotes 1-13 and 20)	
No. 1		975	—	650	70	425	725	1,000,000		
No. 2		625	—	325	70	425	475	800,000		
Select Structural	Posts and Timbers	1100	—	725	70	425	925	1,000,000		
No. 1		875	—	600	70	425	800	1,000,000		
No. 2		500	—	350	70	425	375	800,000		
Selected Decking	Decking	—	1450	—	—	—	—	1,100,000		
Commercial Decking		—	1200	—	—	—	—	1,000,000		
Selected Decking	Decking	—	1550	(Surfaced at 15% max. m.c. and used at 15% max. m.c.)	—	—	—	1,100,000		
Commercial Decking		—	1300	—	—	—	—	1,000,000		

**TABLE 4A—DESIGN VALUES FOR VISUALLY GRADED STRUCTURAL LUMBER**

(Design values listed are for normal loading conditions. See other provisions in the footnotes and in the National Design Specification for adjustments of tabulated values.)

Species and commercial grade	Size classification	Design values in pounds per square inch							Grading rules agency	
		Extreme fiber in bending "F <sub>B</sub> "		Tension parallel to grain "F <sub>T</sub> "	Horizontal shear "F <sub>V</sub> "	Compression perpendicular to grain "F <sub>C</sub> ⊥"	Compression parallel to grain "F <sub>C</sub> "	Modulus of elasticity "E"		
		Single-member uses	Repetitive-member uses							
<b>WESTERN CEDARS (NORTH)</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural		1450	1700	850	70	425	1200	1,100,000	NLGA          	
No. 1	2" to 3"	1250	1450	725	70	425	950	1,100,000		
No. 2	thick	1000	1200	600	70	425	750	1,000,000		
No. 3	2" to 4"	575	650	325	70	425	450	900,000		
Appearance Stud	wide	1250	1450	725	70	425	1100	1,100,000		
	575	650	325	70	425	450	900,000			
Construction Standard Utility	2" to 4"	750	850	425	70	425	850	900,000		
	thick	425	475	250	70	425	700	900,000		
	4" wide	200	225	125	70	425	450	900,000		
Select Structural		1250	1450	825	70	425	1050	1,100,000		
No. 1	2" to 4"	1050	1250	725	70	425	950	1,100,000	(A Canadian agency. See footnotes 1-12, 15,16 and 20)	
No. 2	thick	875	1000	475	70	425	800	1,000,000		
No. 3	5" and wider	525	600	275	70	425	500	900,000		
Appearance Stud		1050	1250	725	70	425	1100	1,100,000		
	525	600	275	70	425	500	900,000			
Select Structural	Beams and Stringers	1150	—	675	65	425	850	1,000,000		
No. 1		925	—	475	65	425	700	1,000,000		
No. 2		625	—	300	65	425	450	800,000		
Select Structural	Posts and Timbers	1050	—	700	65	425	900	1,000,000		
No. 1		875	—	575	65	425	800	1,000,000		
No. 2		500	—	350	65	425	550	800,000		
Select Commercial	Decking	1200	1400	—	—	425	—	1,100,000		
		1050	1200	—	—	425	—	1,000,000		
<b>WESTERN HEMLOCK</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural		1800	2100	1050	90	410	1450	1,600,000	WCLIB          	
No. 1	2" to 4"	1550	1800	900	90	410	1150	1,600,000		
No. 2	thick	1300	1450	750	90	410	900	1,400,000		
No. 3	2" to 4"	700	800	425	90	410	550	1,300,000		
Appearance Stud	wide	1550	1800	900	90	410	1350	1,600,000		
	700	800	425	90	410	550	1,300,000			
Construction Standard Utility	2" to 4"	925	1050	550	90	410	1050	1,300,000		
	thick	525	600	300	90	410	850	1,300,000		
	4" wide	250	275	150	90	410	550	1,300,000		
Select Structural		1550	1800	1050	90	410	1300	1,600,000		
No. 1	2" to 4"	1350	1550	900	90	410	1150	1,600,000	(See footnotes 1-12 and 20)	
No. 2	thick	1100	1250	575	90	410	975	1,400,000		
No. 3	5" and wider	650	750	325	90	410	625	1,300,000		
Appearance Stud		1350	1550	900	90	410	1350	1,600,000		
	650	750	325	90	410	625	1,300,000			
Select Structural	Beams and Stringers	1400	—	825	85	410	1000	1,400,000		
No. 1		1150	—	575	85	410	850	1,400,000		
No. 2		750	—	375	85	410	550	1,100,000		
Select Structural	Posts and Timbers	1300	—	875	85	410	1100	1,400,000		
No. 1		1050	—	700	85	410	950	1,400,000		
No. 2		650	—	425	85	410	650	1,100,000		
Select Dex Commercial Dex	Decking	1500	1750	—	—	410	—	1,600,000	WCLIB          	
		1300	1450	—	—	410	—	1,400,000		
Select Structural	Beams and Stringers	1400	—	950	85	410	1000	1,400,000		
No. 1		1150	—	775	85	410	850	1,400,000		
No. 2		750	—	375	85	410	550	1,100,000		
Select Structural	Posts and Timbers	1300	—	875	85	410	1100	1,400,000		
No. 1		1050	—	700	85	410	950	1,400,000		
No. 2		600	—	400	85	410	425	1,100,000		
Selected Decking Commercial Decking	Decking	—	1750	—	—	—	—	1,600,000		
		—	1450	—	—	—	—	1,400,000		
Selected Decking Commercial Decking	Decking	—	1900	(Surfaced at 15% max. m.c. and used at 15% max. m.c.)				1,700,000	(See footnotes 1-13 and 20)	
		—	1600					1,500,000		

**TABLE 4A—DESIGN VALUES FOR VISUALLY GRADED STRUCTURAL LUMBER**

(Design values listed are for normal loading conditions. See other provisions in the footnotes and in the National Design Specification for adjustments of tabulated values.)

Species and commercial grade	Size classification	Design values in pounds per square inch							Grading rules agency	
		Extreme fiber in bending "F <sub>B</sub> "		Tension parallel to grain "F <sub>T</sub> "	Horizontal shear "F <sub>V</sub> "	Compression perpendicular to grain "F <sub>C</sub> ⊥"	Compression parallel to grain "F <sub>C</sub> "	Modulus of elasticity "E"		
		Single-member uses	Repetitive-member uses							
<b>WESTERN HEMLOCK (NORTH)</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural										
No. 1	2" to 3"	1800	2100	1050	75	410	1450	1,600,000	NLGA  (A Canadian agency. See footnotes 1-12, 15, 16 and 20)	
No. 2	thick	1550	1800	900	75	410	1150	1,600,000		
No. 3	2" to 4"	1300	1450	750	75	410	900	1,400,000		
Appearance Stud	wide	700	800	425	75	410	550	1,300,000		
Construction Standard Utility	2" to 4"	1550	1800	900	75	410	1050	1,300,000		
	thick	1350	1550	750	75	410	850	1,300,000		
	4" wide	1100	1250	575	75	410	550	1,300,000		
Select Structural	2" to 4"	1550	1800	1050	75	410	1300	1,600,000		
No. 1	thick	1350	1550	900	75	410	1150	1,600,000		
No. 2	5" and wider	1100	1250	325	75	410	975	1,400,000		
Appearance Stud	wide	650	750	900	75	410	625	1,300,000		
Select Structural	Beams and Stringers	1400	—	825	70	410	1000	1,400,000		
No. 1		1150	—	575	70	410	850	1,400,000		
No. 2		750	—	375	70	410	550	1,100,000		
Select Structural	Posts and Timbers	1300	—	875	70	410	1100	1,400,000		
No. 1		1050	—	700	70	410	950	1,400,000		
No. 2		650	—	425	70	410	650	1,100,000		
Select Commercial	Decking	1500	1750	—	—	410	—	1,600,000		
		1300	1450	—	—	410	—	1,400,000		
<b>WESTERN WHITE PINE</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural										
No. 1	2" to 3"	1350	1550	775	65	375	1100	1,400,000	NLGA  (A Canadian agency. See footnotes 1-12, 15, 16 and 20)	
No. 2	thick	1150	1300	675	65	375	875	1,400,000		
No. 3	2" to 4"	925	1050	550	65	375	675	1,300,000		
Appearance Stud	wide	525	600	300	65	375	425	1,200,000		
Construction Standard Utility	2" to 4"	525	600	675	65	375	1050	1,400,000		
	thick	375	425	225	65	375	650	1,200,000		
	4" wide	175	200	100	65	375	425	1,200,000		
Select Structural	2" to 4"	675	775	400	65	375	775	1,200,000		
No. 1	thick	375	425	225	65	375	650	1,200,000		
No. 2	5" and wider	475	550	250	65	375	725	1,300,000		
Appearance Stud	wide	975	1150	650	65	375	450	1,200,000		
Select Structural	Beams and Stringers	1050	—	600	60	375	775	1,300,000		
No. 1		850	—	425	60	375	625	1,300,000		
No. 2		550	—	275	60	375	400	1,000,000		
Select Structural	Posts and Timbers	975	—	650	60	375	800	1,300,000		
No. 1		775	—	525	60	375	700	1,300,000		
No. 2		450	—	300	60	375	500	1,000,000		
Select Commercial	Decking	1100	1300	—	—	375	—	1,400,000		
		925	1050	—	—	375	—	1,300,000		

**TABLE 4A—DESIGN VALUES FOR VISUALLY GRADED STRUCTURAL LUMBER**

(Design values listed are for normal loading conditions. See other provisions in the footnotes and in the National Design Specification for adjustments of tabulated values.)

Species and commercial grade	Size classification	Design values in pounds per square inch							Grading rules agency	
		Extreme fiber in bending "F <sub>b</sub> "		Tension parallel to grain "F <sub>T</sub> "	Horizontal shear "F <sub>v</sub> "	Compression perpendicular to grain "F <sub>c</sub> ⊥"	Compression parallel to grain "F <sub>c</sub> "	Modulus of elasticity "E"		
		Single-member uses	Repetitive-member uses							
<b>WHITE WOODS (WESTERN WOODS)</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural		1350	1550	775	70	315	950	1,100,000	WWPA  (See footnotes 1-13 and 20)	
No. 1	2" to 4"	1150	1300	650	70	315	750	1,100,000		
No. 2	thick	925	1050	550	70	315	600	1,000,000		
No. 3	2" to 4"	525	600	300	70	315	375	900,000		
Appearance Stud	wide	1150	1300	650	70	315	900	1,100,000		
		525	600	300	70	315	375	900,000		
Construction Standard Utility	2" to 4"	675	775	400	70	315	675	900,000		
	thick	375	425	225	70	315	550	900,000		
	4" wide	175	200	100	70	315	375	900,000		
Select Structural		1150	1300	775	70	315	850	1,100,000		
No. 1	2" to 4"	975	1100	650	70	315	750	1,100,000		
No. 2	thick	800	925	425	70	315	625	1,000,000		
No. 3	5" and wider	475	550	250	70	315	400	900,000		
Appearance Stud		975	1100	650	70	315	900	1,100,000		
		475	550	250	70	315	400	900,000		
Select Structural	Beams and Stringers	1000	—	700	65	315	675	1,000,000	NHPMA  (See footnotes 1-12 and 20)	
No. 1		850	—	575	65	315	550	1,000,000		
No. 2		550	—	275	65	315	350	800,000		
Select Structural	Posts and Timbers	950	—	650	65	315	700	1,000,000		
No. 1		775	—	525	65	315	625	1,000,000		
No. 2		450	—	300	65	315	275	800,000		
Selected Decking Commercial Decking	Decking	—	1300	—	—	—	—	1,100,000		
		—	1050	—	—	—	—	1,000,000		
Selected Decking Commercial Decking	Decking	—	1400	(Surfaced at 15% max. m.c. and used at 15% max. m.c.)			—	1,100,000		
		—	1150				—	1,000,000		
<b>YELLOW-POPLAR</b> (Surfaced dry or surfaced green. Used at 19% max. m.c.)										
Select Structural	2" to 3"	1500	1700	875	80	420	1050	1,500,000	NHPMA  (See footnotes 1-12 and 20)	
No. 1	thick	1250	1450	750	80	420	825	1,500,000		
No. 2	2" to 4"	1050	1200	625	75	420	650	1,300,000		
No. 3	wide	575	675	350	75	420	400	1,200,000		
Stud		575	675	350	75	420	400	1,200,000		
Construction Standard Utility	2" to 4"	750	875	450	80	420	750	1,200,000		
	thick	425	500	250	75	420	625	1,200,000		
	4" wide	200	225	125	75	420	400	1,200,000		
Select Structural		1300	1500	850	75	420	925	1,500,000		
No. 1	2" to 4"	1100	1250	725	75	420	825	1,500,000		
No. 2	thick	900	1050	475	75	420	700	1,300,000		
No. 3	5" and wider	525	600	275	75	420	425	1,200,000		
Appearance Stud		1100	1250	725	75	420	1000	1,500,000		
		525	600	275	75	420	425	1,200,000		

See Following Pages for Footnotes Applicable to Table 4A, Visually Graded Lumber.

**Table 4A Footnotes**  
Applicable to Visually Graded Structural Lumber

1. Following is a list of agencies certified by the American Lumber Standards Committee Board of Review (as of 1982) for inspection and grading of untreated lumber under the rules indicated. For the most up-to-date list of certified agencies, write to:

American Lumber Standards Committee  
P.O. Box 210  
Germantown, Maryland 20874

Rules Writing Agencies	Rules for which grading authorized
Northeastern Lumber Manufacturers Association (NELMA) . . . . .	NELMA, NLGA
4 Fundy Road, Falmouth, Maine 04105	
Northern Hardwood and Pine Manufacturers Association (serviced by NELMA) . . . . .	NHPMA, WCLIB, WWPA, NLGA
4 Fundy Road, Falmouth, Maine 04105	
Redwood Inspection Service (RIS) . . . . .	RIS, WCLIB, WWPA
591 Redwood Highway, Suite 3100, Mill Valley, California 94941	
Southern Pine Inspection Bureau (SPIB) . . . . .	SPIB, NELMA
4709 Scenic Highway, Pensacola, Florida 32504	
West Coast Lumber Inspection Bureau (WCLIB) . . . . .	WCLIB, RIS, WWPA, NLGA
6980 SW Varnes Rd., P.O. Box 23145, Portland, OR 97223	
Western Wood Products Association (WWPA) . . . . .	WWPA, WCLIB, NLGA, RIS
1500 Yeon Building, Portland, Oregon 97204	
National Lumber Grades Authority (NLGA) . . . . .	
P.O. Box 97 Ganges, B.C., Canada V0S 1EO	
<b>Non-Rules Writing Agencies</b>	
California Lumber Inspection Service . . . . .	RIS, WCLIB, WWPA, NLGA
Pacific Lumber Inspection Bureau, Inc. . . . .	RIS, WCLIB, WWPA, NLGA
Timber Products Inspection . . . . .	RIS, SPIB, WCLIB, WWPA, NHPMA, NELMA, NLGA
Alberta Forest Products Association . . . . .	NLGA
Canadian Lumbermans Association . . . . .	NLGA
Cariboo Lumber Manufacturers Association . . . . .	NLGA
Central Forest Products Association . . . . .	NLGA
Council of Forest Industries of British Columbia . . . . .	NLGA
Interior Lumber Manufacturers Association . . . . .	NLGA
MacDonald Inspection . . . . .	NLGA
Maritime Lumber Bureau . . . . .	NLGA
Ontario Lumber Manufacturers Association . . . . .	NLGA
Pacific Lumber Inspection Bureau . . . . .	NLGA
Quebec Lumber Manufacturers Association . . . . .	NLGA

2. The design values herein are applicable to lumber that will be used under dry conditions such as in most covered structures. For 2" to 4" thick lumber the DRY surfaced size shall be used. In calculating design values, the natural gain in strength and stiffness that occurs as lumber dries has been taken into consideration as well as the reduction in size that occurs when unseasoned lumber shrinks. The gain in load carrying capacity due to increased strength and stiffness resulting from drying more than offsets the design effect of size reductions due to shrinkage. For 5" and thicker lumber, the surfaced sizes also may be used because design values have been adjusted to compensate for any loss in size by shrinkage which may occur.

3. Tabulated tension parallel to grain values for all species for 5" and wider, 2" to 4" thick (and 2½" to 4" thick) size classifications apply to 5" and 6" widths only, for grades of Select Structural, No. 1, No. 2, No. 3, Appearance and Stud, (including dense grades). For lumber wider than 6" in these grades, the tabulated "F<sub>T</sub>" values shall be multiplied by the following factors:

Grade (2" to 4" thick, 5" and wider) (2½" to 4" thick, 5" and wider) (Includes "Dense" grades)	Multiply tabulated "F <sub>T</sub> " values by		
	5" & 6" wide	8" wide	10" and wider
	1.00	0.90	0.80
Select Structural	1.00	0.80	0.60
No. 1, No. 2, No. 3 and Appearance	1.00	—	—
Stud	1.00	—	—

4. Design values for all species of Stud grade in 5" and wider size classifications apply to 5" and 6" widths only.

5. Values for "F<sub>B</sub>", "F<sub>T</sub>", and "F<sub>C</sub>" for all species of the grades of Construction, Standard and Utility apply only to 4" widths. Design values for 2" and 3" widths of these grades are available from the grading rules agencies (see Note 1).

6. The values in Table 4A for dimension lumber 2" to 4" in thickness are based on edgewise use. When such lumber is used flatwise, the design values for extreme fiber in bending for all species may be multiplied by the following factors:

Width	Dimension lumber used flatwise		
	Thickness	2"	3"
2" to 4"	1.10	1.04	1.00
5" and wider	1.22	1.16	1.11

7. The design values in Table 4A for extreme fiber in bending for decking may be increased by 10 percent for 2" thick decking and by 4 percent for 3" thick decking. (Not applicable to California Redwood.)

8. When 2" to 4" thick lumber is manufactured at a maximum moisture content of 15 percent and used in a condition where the moisture content does not exceed 15 percent, the design values for surfaced dry or surfaced green lumber shown in Table 4A may be multiplied by the following factors. (For Southern Pine and Virginia Pine-Pond Pine use tabulated design values without adjustment):

2" to 4" thick lumber manufactured and used at 15 percent maximum moisture content (m.c. 15)					
Extreme fiber in bending "F <sub>B</sub> "	Tension parallel to grain "F <sub>T</sub> "	Horizontal shear "F <sub>V</sub> "	Compression perpendicular to grain "F <sub>C</sub> ⊥"	Compression* parallel to grain "F <sub>C</sub> "	Modulus* of elasticity "E"
1.08	1.08	1.05	1.00	1.17	1.05
* For Redwood use only				1.15	1.04

9. When 2" to 4" thick lumber is designed for use where the moisture content will exceed 19 percent for an extended period of time, the design values shown herein shall be multiplied by the following factors, except that for Southern Pine and Virginia Pine-Pond Pine footnote 18 applies:

2" to 4" thick lumber used where moisture content will exceed 19%					
Extreme fiber in bending "F <sub>B</sub> "	Tension parallel to grain "F <sub>T</sub> "	Horizontal shear "F <sub>V</sub> "	Compression perpendicular to grain "F <sub>C⊥</sub> "	Compression parallel to grain "F <sub>C</sub> "	Modulus of elasticity "E"
0.86	0.84	0.97	0.67	0.70	0.97

10. When lumber 5" and thicker is designed for use where the moisture content will exceed 19 percent for an extended period of time, the design values shown in Table 4A (except those for Southern Pine and Virginia Pine-Pond Pine) shall be multiplied by the following factors:

5" and thicker lumber used where moisture content will exceed 19%					
Extreme fiber in bending "F <sub>B</sub> "	Tension parallel to grain "F <sub>T</sub> "	Horizontal shear "F <sub>V</sub> "	Compression perpendicular to grain "F <sub>C⊥</sub> "	Compression parallel to grain "F <sub>C</sub> "	Modulus of elasticity "E"
1.00	1.00	1.00	0.67	0.91	1.00

11. Specific horizontal shear values may be established by use of the following table when length of split, or size of check or shake is known and no increase in them is anticipated. For California Redwood, Southern Pine, Virginia Pine-Pond Pine, or Yellow-Poplar, the provisions in this Footnote apply only to the following F<sub>V</sub> Values: 80 psi, California Redwood; 95 psi, Southern Pine (KD-15); 90 psi, Southern Pine (S-Dry); 85 psi, Southern Pine (S-Green); 95 psi, Virginia Pine-Pond Pine (KD-15); 90 psi, Virginia Pine-Pond Pine (S-Dry); 85 psi, Virginia Pine-Pond Pine (S-Green); and 75 psi, Yellow-Poplar.

Shear Stress Modification Factor					
Length of split on wide face of 2" lumber (nominal):	Multiply tabulated "F <sub>V</sub> " value by:	Length of split on wide face of 3" and thicker lumber (nominal):	Multiply tabulated "F <sub>V</sub> " value by:	Size of shake* in 3" and thicker lumber (nominal):	Multiply tabulated "F <sub>V</sub> " value by:
no split .....	2.00	no split .....	2.00	no shake .....	2.00
1/8 x wide face .....	1.67	1/2 x narrow face .....	1.67	1/8 x narrow face .....	1.67
3/8 x wide face .....	1.50	1 x narrow face .....	1.33	1/2 x narrow face .....	1.33
1 x wide face .....	1.33	1 1/2 x narrow face or more ...	1.00	1/2 x narrow face or more ...	1.00
1 1/2 x wide face or more .....	1.00			*Shake is measured at the end between lines enclosing the shake and parallel to the wide face.	

12. Stress rated boards of nominal 1", 1 1/4" and 1 1/2" thickness, 2" and wider, of most species, are permitted the design values shown for Select Structural, No. 1, No. 2, No. 3, Construction, Standard, Utility, Appearance, Clear Heart Structural and Clear Structural grades as shown in the 2" to 4" thick categories herein, when graded in accordance with the stress rated board provisions in the applicable grading rules. Information on stress rated board grades applicable to the various species is available from the respective grading rules agencies. Information on additional design values may also be available from the respective grading agencies.

13. When Decking graded to WWPA rules is surfaced at 15 percent maximum moisture content and used where the moisture content will exceed 15 percent for an extended period of time, the tabulated design values for Decking surfaced at 15 percent maximum moisture content shall be multiplied by the following factors: Extreme Fiber in Bending "F<sub>B</sub>", 0.79; Modulus of Elasticity "E", 0.92.

14. To obtain a recommended design value for Spruce Pine, multiply the appropriate design value for Virginia Pine-Pond Pine by the corresponding conversion factor shown below and round to the nearest 100,000 psi for modulus of elasticity; to the next lower multiple of 5 psi for horizontal shear and compression perpendicular to grain; to the next lower multiple of 50 psi for bending, tension parallel to grain and compression parallel to grain if 1000 psi or greater, 25 psi otherwise.

Conversion Factors for Determining Design Values for Spruce Pine							
Design Category	Extreme fiber in bending "F <sub>B</sub> "		Tension parallel to grain "F <sub>T</sub> "	Horizontal Shear "F <sub>V</sub> "	Compression perpendicular to grain "F <sub>C⊥</sub> "	Compression parallel to grain "F <sub>C</sub> "	Modulus of elasticity "E"
	Single member uses	Repetitive member uses					
Conversion Factor	.784	.784	.784	.766	.965	.682	.807

15. National Lumber Grades Authority is the Canadian rules writing agency responsible for preparation, maintenance and dissemination of a uniform softwood lumber grading rule for all Canadian species.

16. For species graded to NLGA rules, values shown in Table 4A for Select Structural, No. 1, No. 2, No. 3 and Stud grades are not applicable to 3" x 4" and 4" x 4" sizes.

17. Repetitive member design values for extreme fiber in bending for Southern Pine grades of Dense Structural 86, 72 and 65 apply to 2" to 4" thicknesses only.

18. When 2" to 4" thick Southern Pine or Virginia Pine-Pond Pine lumber is surfaced dry or at 15 percent maximum moisture content (KD-15) and is designed for use where the moisture content will exceed 19 percent for an extended period of time, the design values in Table 4A for the corresponding grades of 2 1/2" to 4" thick surfaced green Southern Pine lumber shall be used. The net green size may be used in such designs.

19. When 2" to 4" thick Southern Pine or Virginia Pine-Pond Pine lumber is surfaced dry or at 15 percent maximum moisture content (KD-15) and is designed for use under dry conditions, such as in most covered structures, the net DRY size shall be used in design. For other sizes and conditions of use, the net green size may be used in design.

20. When the depth of a beam, stringer, post, timber or other rectangular sawn lumber member 5" or thicker exceeds 12", the design value for the extreme fiber in bending, F<sub>B</sub>, shall be multiplied by the size factor, C<sub>F</sub>, as determined by the following formula:

$$C_F = \left(\frac{12}{d}\right)^{1/3}$$

**TABLE 4B. DESIGN VALUES FOR MACHINE STRESS RATED STRUCTURAL LUMBER**

(Design values listed are for normal loading conditions.<sup>6,7</sup> See footnotes, and other provisions in the National Design Specification, for adjustments of tabulated values.<sup>9</sup>)

Grade designation <sup>11</sup>	Grading rules agency (see footnotes 1,2,3,4)	Size classification	Design values in pounds per square inch <sup>10</sup>				
			Extreme fiber in bending "F <sub>B</sub> " <sup>8</sup>		Tension parallel to grain "F <sub>T</sub> "	Compression parallel to grain "F <sub>C</sub> "	Modulus of elasticity "E"
			Single-member uses	Repetitive-member uses			
900f-1.0E	3,4		900	1050	350	725	1,000,000
1200f-1.2E	1,2,3,4		1200	1400	600	950	1,200,000
1350f-1.3E	2,3,4		1350	1550	750	1075 <sup>12</sup>	1,300,000
1450f-1.3E	1,3,4		1450	1650	800	1150	1,300,000
1500f-1.3E	2		1500	1750	900	1200	1,300,000
1500f-1.4E	1,2,3,4		1500	1750	900	1200	1,400,000
1650f-1.4E	2		1650	1900	1020	1320	1,400,000
1650f-1.5E	1,2,3,4		1650	1900	1020	1320	1,500,000
1800f-1.6E	1,2,3,4		1800	2050	1175	1450	1,600,000
1950f-1.5E	2	Machine rated	1950	2250	1375	1550	1,500,000
1950f-1.7E	1,2,4	lumber	1950	2250	1375	1550	1,700,000
2100f-1.8E	1,2,3,4	2" thick or less	2100	2400	1575	1700	1,800,000
2250f-1.6E	2	All widths	2250	2600	1750	1800	1,600,000
2250f-1.9E	1,2,4		2250	2600	1750	1800	1,900,000
2400f-1.7E	2		2400	2750	1925	1925	1,700,000
2400f-2.0E	1,2,3,4		2400	2750	1925	1925	2,000,000
2550f-2.1E	1,2,4		2550	2950	2050	2050	2,100,000
2700f-2.2E	1,2,3,4		2700	3100	2150	2150	2,200,000
2850f-2.3E	2,4		2850	3300	2300	2300	2,300,000
3000f-2.4E	1,2		3000	3450	2400	2400	2,400,000
3150f-2.5E	2		3150	3600	2500	2500	2,500,000
3300f-2.6E	2		3300	3800	2650	2650	2,600,000
900f-1.0E	1,2,3	See footnote 5	900	1050	350	725	1,000,000
900f-1.2E	1,2,3		900	1050	350	725	1,200,000
1200f-1.5E	1,2,3		1200	1400	600	950	1,500,000
1350f-1.8E	1,2		1350	1550	750	1075	1,800,000
1500f-1.8E	3		1500	1750	900	1200	1,800,000
1800f-2.1E	1,2,3		1800	2050	1175	1450	2,100,000

Table 4B. Footnotes Applicable to MACHINE STRESS RATED LUMBER

- NLGA grading rules, see Footnote 1, Table 4A.
- SPIB grading rules, see Footnote 1, Table 4A.
- WCLIB grading rules, see Footnote 1, Table 4A.
- WWPA grading rules, see Footnote 1, Table 4A.
- Size classifications for these grades are:  
NLGA—Machine Rated Lumber; 2" thick or less, all widths.  
SPIB—Machine Rated Lumber; 2" thick or less, all widths.  
WCLIB—Machine Rated Joists; 2" thick or less, 6" and wider.
- Stresses apply for lumber used at 19 percent maximum moisture content.
- When lumber 2" thick or less is designed for use where the moisture content will exceed 19 percent for an extended period of time, the design values shown herein shall be multiplied by the following factors.

Lumber 2" thick or less used where moisture content will exceed 19%					
Extreme fiber in bending "F <sub>B</sub> "	Tension parallel to grain "F <sub>T</sub> "	Horizontal shear "F <sub>V</sub> "	Compression perpendicular to grain "F <sub>C</sub> "	Compression parallel to grain "F <sub>C</sub> "	Modulus of elasticity "E"
0.86	0.84	0.97	0.67	0.70	0.97

8. Tabulated extreme fiber in bending values "F<sub>B</sub>" are applicable to lumber loaded on edge. When loaded flatwise, these values may be increased by multiplying by the following factors:

Nominal width (in.)	3"	4"	5"	6"	8"	10"	12"	14"
Factor	1.06	1.10	1.12	1.15	1.19	1.22	1.25	1.28

9. Footnotes 1, 2, 11 and 19 to Table 4A apply also to Machine Stress Rated Lumber.

10. Design values for horizontal shear "F<sub>V</sub>" and compression perpendicular to grain "F<sub>C</sub>" for lumber used under dry conditions are the same as the values listed in Table 4A for No. 2 visually graded lumber of the appropriate species. For "Mixed Species" graded under WCLIB grading rules, F<sub>V</sub> = 70 psi and F<sub>C</sub> = 315 psi.

11. For any given value of fiber stress in bending, "F<sub>B</sub>", the average modulus of elasticity, "E", may vary depending upon species, timber source and other variables. The "E" values included in the "F-E" grade designations in Table 4B are those usually associated with each "F<sub>B</sub>" level. Grade stamps may show higher or lower "E" values (in increments of 100,000 psi) if machine rating indicates the assignment is appropriate. When an "E" value associated with a designated "I" level is lower or higher than those listed in Table 4B, the tabulated "F<sub>B</sub>", "F<sub>T</sub>", and "F<sub>C</sub>" values associated with the designated "I" value are applicable. The "E" value for design shall be that associated with the "E" value on the grade stamp.

12. When graded under WWPA or WCLIB grading rules, value shall be 1100 psi.

**TABLE 5A—DESIGN VALUES FOR STRUCTURAL GLUED LAMINATED SOFTWOOD TIMBERS:  
MEMBERS STRESSED PRIMARILY IN BENDING<sup>1,2,3,4,6,14</sup>**

Design values are for normal load duration and dry conditions of use. See footnotes, and other provisions in the National Design Specification for Wood Construction, for adjustments of calculated values.

Combination Symbol <sup>6</sup>	Species Outer Laminations/ Core Laminations <sup>7</sup>	Design values in pounds per square inch																
		BENDING ABOUT X-X AXIS							BENDING ABOUT Y-Y AXIS							AXIALLY LOADED		
		Loaded Perpendicular to Wide Faces of Laminations				Loaded Parallel to the Wide Faces of the Laminations												
		Extreme Fiber in Bending <sup>5</sup>	Compression Perp. to Grain						Horizontal Shear (For Members With Multiple Piece Laminations Which Are Not Edge Glued) <sup>16</sup>									
		Tension Zone Stressed in Tension	Compression Zone Stressed <sup>8</sup> in Tension	Tension Face <sup>11,12</sup>	Compression Face <sup>11,12</sup>	Horizontal Shear <sup>12</sup>	Modulus of Elasticity	Extreme Fiber in Bending <sup>5,15</sup> F <sub>byy</sub>	Compression Perpendicular to Grain Side faces F <sub>c1yy</sub>	Horizontal Shear F <sub>vyy</sub>	Modulus of Elasticity E <sub>yy</sub>	Tension Parallel to Grain Ft	Compression Parallel to Grain F <sub>c</sub>	Modulus of Elasticity E				
<b>VISUALLY GRADED WESTERN SPECIES</b>		F <sub>bxx</sub>	F <sub>bxx</sub>	F <sub>c1xx</sub>	F <sub>c1xx</sub>	F <sub>vxx</sub>	E <sub>xx</sub>											
16F-V1	DF/WW	1600	800	560 <sup>11,12</sup>	560 <sup>12</sup>	140	1,300,000	950	255	130 <sup>17</sup>	65 <sup>17</sup>	1,100,000	675	975	1,100,000			
16F-V2	HF/HF	1600	800	500 <sup>12</sup>	375 <sup>12</sup>	155	1,400,000	1250	375	135	70	1,300,000	875	1300	1,300,000			
16F-V3	DF/DF	1600	800	560 <sup>11,12</sup>	560 <sup>12</sup>	165	1,500,000	1450	560	145	70	1,500,000	950	1550	1,500,000			
16F-V4 <sup>9</sup>	DF/N3WW	1600	800	650	560 <sup>12</sup>	90 <sup>12</sup>	1,500,000	900	255	130 <sup>17</sup>	65 <sup>17</sup>	1,300,000	650	600	1,300,000			
16F-V5 <sup>9</sup>	DF/N3DF	1600	800	650	560 <sup>12</sup>	90 <sup>12</sup>	1,600,000	1000	470	135	70	1,500,000	750	875	1,500,000			
16F-V6 <sup>10</sup>	DF/DF	1600	1600	560 <sup>11,12</sup>	560 <sup>12</sup>	165	1,500,000	1450	560	145	75	1,400,000	950	1550	1,500,000			
16F-V7 <sup>10</sup>	HF/HF	1600	1600	375 <sup>12</sup>	375 <sup>12</sup>	155	1,400,000	1200	375	135	70	1,300,000	850	1350	1,300,000			
16F-V8	DFS/DFS	1600	800	650	500	165	1,200,000	1200	500	145	75	1,100,000	825	1350	1,100,000			
20F-V1	DF/WW	2000	1000	650	560 <sup>12</sup>	140	1,400,000	1000	255	130 <sup>17</sup>	65 <sup>17</sup>	1,200,000	750	1000	1,200,000			
20F-V2	HF/HF	2000	1000	500 <sup>12</sup>	375 <sup>12</sup>	155	1,500,000	1200	375	135	70	1,400,000	950	1350	1,400,000			
20F-V3	DF/DF	2000	1000	650	560 <sup>12</sup>	165	1,600,000	1450	560	145	75	1,500,000	1000	1550	1,500,000			
20F-V4	DF/DF	2000	1000	590 <sup>11,12</sup>	560 <sup>12</sup>	165	1,600,000	1450	560	145	75	1,600,000	1000	1550	1,600,000			
20F-V5 <sup>9</sup>	DF/N3WW	2000	1000	650	560 <sup>12</sup>	90 <sup>12</sup>	1,600,000	1000	255	135 <sup>17</sup>	70 <sup>17</sup>	1,300,000	750	725	1,300,000			
20F-V6 <sup>9</sup>	DF/N3DF	2000	1000	650	560 <sup>12</sup>	90 <sup>12</sup>	1,600,000	1000	470	135	70	1,500,000	775	900	1,500,000			
20F-V7 <sup>10</sup>	DF/DF	2000	2000	650	650	165	1,600,000	1450	560	145	75	1,600,000	1000	1600	1,600,000			
20F-V8 <sup>10</sup>	DF/DF	2000	2000	590 <sup>11,12</sup>	590 <sup>11,12</sup>	165	1,700,000	1450	560	145	75	1,600,000	1000	1600	1,600,000			
20F-V9 <sup>10</sup>	HF/HF	2000	2000	500 <sup>12</sup>	500 <sup>12</sup>	155	1,500,000	1400	375	135	70	1,400,000	975	1400	1,400,000			
20F-V10	DF/HF	2000	1000	650	560	155	1,500,000	1300	375	135	70	1,400,000	950	1500	1,400,000			
20F-V11	DFS/DFS	2000	1000	650	500	165	1,300,000	1400	500	145	75	1,100,000	900	1400	1,100,000			
22F-V1	DF/WW	2200	1100	650	560 <sup>12</sup>	140	1,600,000	1050	255	130 <sup>17</sup>	65 <sup>17</sup>	1,300,000	850	1100	1,300,000			
22F-V2	HF/HF	2200	1100	500 <sup>12</sup>	500 <sup>12</sup>	155	1,500,000	1250	375	135	70	1,400,000	950	1350	1,400,000			
22F-V3	DF/DF	2200	1100	650	560 <sup>12</sup>	165	1,700,000	1450	560	145	75	1,600,000	1050	1500	1,600,000			
22F-V4	DF/DF	2200	1100	590 <sup>11,12</sup>	560 <sup>12</sup>	165	1,700,000	1450	560	145	75	1,600,000	1000	1550	1,600,000			
22F-V5 <sup>9</sup>	DF/N3WW	2200	1100	650	560 <sup>12</sup>	90 <sup>12</sup>	1,600,000	1100	255	135 <sup>17</sup>	75 <sup>17</sup>	1,400,000	800	725	1,400,000			
22F-V6 <sup>9</sup>	DF/N3DF	2200	1100	650	560 <sup>12</sup>	90 <sup>12</sup>	1,700,000	1250	470	135	75	1,600,000	900	925	1,500,000			
22F-V7 <sup>10</sup>	DF/DF	2200	2200	650	650	165	1,800,000	1450	560	145	75	1,500,000	1100	1650	1,600,000			
22F-V8 <sup>10</sup>	DF/DF	2200	2200	590 <sup>11,12</sup>	590 <sup>11,12</sup>	165	1,700,000	1450	560	145	75	1,600,000	1050	1650	1,800,000			
22F-V9 <sup>10</sup>	HF/HF	2200	2200	500 <sup>12</sup>	500 <sup>12</sup>	155	1,500,000	1250	375	135	70	1,400,000	975	1400	1,400,000			
22F-V10	DF/DFS	2200	1100	650	560 <sup>12</sup>	165	1,600,000	1600	500	145	75	1,300,000	1000	1400	1,300,000			
24F-V1	DF/WW	2400	1200	650	650	140	1,700,000	1250	255	135 <sup>17</sup>	70 <sup>17</sup>	1,400,000	1000	1300	1,400,000			
24F-V2	HF/HF	2400	1200	500 <sup>12</sup>	500 <sup>12</sup>	155	1,500,000	1250	375	135	70	1,400,000	950	1300	1,400,000			
24F-V3	DF/DF	2400	1200	650	560 <sup>12</sup>	165	1,800,000	1500	560	145	75	1,600,000	1100	1600	1,600,000			
24F-V4	DF/DF	2400	1200	650	650	165	1,800,000	1500	560	145	75	1,600,000	1150	1650	1,600,000			
24F-V5	DF/HF	2400	1200	650	650	155	1,700,000	1350	375	140	70	1,500,000	1100	1450	1,500,000			
24F-V6 <sup>9</sup>	DF/N3WW	2400	1200	650	560 <sup>12</sup>	90 <sup>12</sup>	1,700,000	1200	255	140 <sup>17</sup>	70 <sup>17</sup>	1,500,000	950	800	1,500,000			
24F-V7 <sup>9</sup>	DF/N3DF	2400	1200	650	560 <sup>12</sup>	90 <sup>12</sup>	1,700,000	1250	470	135	70	1,600,000	900	950	1,600,000			
24F-V8 <sup>10</sup>	DF/DF	2400	2400	650	650	165	1,800,000	1450	560	145	75	1,600,000	1100	1650	1,600,000			
24F-V9 <sup>10</sup>	HF/HF	2400	2400	500 <sup>12</sup>	500 <sup>12</sup>	155	1,500,000	1500	375	135	70	1,400,000	1000	1450	1,400,000			
24F-V10 <sup>10</sup>	DF/HF	2400	2400	650	650	155	1,800,000	1400	375	140	70	1,600,000	1150	1600	1,600,000			
24F-V11	DF/DFS	2400	1200	650	560 <sup>12</sup>	165	1,700,000	1600	500	145	75	1,400,000	1150	1700	1,400,000			
Wet-use factors		0.8	0.8	0.53	0.53	0.876	0.833	0.8	0.53	0.875	0.875	0.833	0.8	0.73	0.833			

**TABLE 5A—DESIGN VALUES FOR STRUCTURAL GLUED LAMINATED SOFTWOOD TIMBERS:  
MEMBERS STRESSED PRIMARILY IN BENDING<sup>1,2,3,4,6,14</sup>**

Design values are for normal load duration and dry conditions of use. See footnotes, and other provisions in the National Design Specification for Wood Construction, for adjustments of calculated values.

Combination Symbol <sup>6</sup>	Species Outer Laminations/ Core Laminations <sup>7</sup>	Design values in pounds per square inch															
		BENDING ABOUT X-X AXIS						BENDING ABOUT Y-Y AXIS						AXIALLY LOADED			
		Loaded Perpendicular to Wide Faces of Laminations				Loaded Parallel to the Wide Faces of the Laminations											
		Extreme Fiber in Bending <sup>5</sup>	Compression Perp. to Grain					Extreme Fiber in Bending <sup>5,15</sup>	Compression Perpendicular to Grain Side faces								
		Tension Zone Stressed in Tension	Compression Zone Stressed <sup>8</sup> in Tension	Tension Face <sup>11,12</sup>	Compression Face <sup>11,12</sup>	Horizontal Shear <sup>12</sup>	Modulus of Elasticity	F <sub>b</sub> y	Horizontal Shear	(For Members With Multiple Piece Laminations Which Are Not Edge Glued) <sup>16</sup>	Modulus of Elasticity	Tension Parallel to Grain Ft	Compression Parallel to Grain F <sub>c</sub>	Modulus of Elasticity	E		
<b>E-RATED WESTERN SPECIES</b>																	
16F-E1	WW/WW	1600	800	255 <sup>12</sup>	255 <sup>12</sup>	140	1,300,000	1050	255	125 <sup>17</sup>	65 <sup>17</sup>	1,200,000	725	925	1,200,000		
16F-E2 <sup>13</sup>	HF/HF	1600	800	500 <sup>12</sup>	500 <sup>12</sup>	155	1,400,000	1250	375	135	70	1,300,000	825	1200	1,300,000		
16F-E3	DF/DF	1600	800	650 <sup>12</sup>	650 <sup>12</sup>	165	1,600,000	1450	560	145	75	1,500,000	975	1600	1,500,000		
16F-E4 <sup>9</sup>	DF/N3WW	1600	800	650 <sup>12</sup>	650 <sup>12</sup>	90 <sup>12</sup>	1,600,000	900	255	130 <sup>17</sup>	65 <sup>17</sup>	1,300,000	675	675	1,300,000		
16F-E5 <sup>9</sup>	DF/N3DF	1600	800	650 <sup>12</sup>	650 <sup>12</sup>	90 <sup>12</sup>	1,600,000	1050	470	135	70	1,500,000	700	900	1,500,000		
16F-E6 <sup>10</sup>	DF/DF	1600	1600	650 <sup>12</sup>	650 <sup>12</sup>	165	1,600,000	1500	560	145	75	1,500,000	1000	1600	1,500,000		
16F-E7 <sup>10,13</sup>	HF/HF	1600	1600	500 <sup>12</sup>	500 <sup>12</sup>	155	1,400,000	1250	375	135	70	1,300,000	850	1150	1,300,000		
20F-E1	WW/WW	2000	1000	255 <sup>12</sup>	255 <sup>12</sup>	140	1,600,000	1100	255	125 <sup>17</sup>	65 <sup>17</sup>	1,300,000	800	1050	1,300,000		
20F-E2 <sup>13</sup>	HF/HF	2000	1000	500 <sup>12</sup>	500 <sup>12</sup>	155	1,600,000	1400	375	135	70	1,400,000	925	1550	1,400,000		
20F-E3	DF/DF	2000	1000	650 <sup>12</sup>	650 <sup>12</sup>	165	1,700,000	1550	560	145	75	1,600,000	1050	1650	1,600,000		
20F-E4 <sup>9</sup>	DF/N3WW	2000	1000	650	650 <sup>12</sup>	90 <sup>12</sup>	1,600,000	1100	255	130 <sup>17</sup>	65 <sup>17</sup>	1,400,000	800	700	1,400,000		
20F-E5 <sup>9</sup>	DF/N3DF	2000	1000	650 <sup>12</sup>	650 <sup>12</sup>	90 <sup>12</sup>	1,700,000	1300	470	135	70	1,600,000	825	975	1,600,000		
20F-E6 <sup>10</sup>	DF/DF	2000	2000	650 <sup>12</sup>	650 <sup>12</sup>	165	1,700,000	1600	560	145	75	1,600,000	1150	1650	1,600,000		
20F-E7 <sup>10,13</sup>	HF/HF	2000	2000	500 <sup>12</sup>	500 <sup>12</sup>	155	1,600,000	1500	375	135	70	1,400,000	1050	1550	1,400,000		
22F-E1	DF/DF	2200	1100	650	650 <sup>12</sup>	165	1,700,000	1550	560	145	75	1,600,000	1050	1600	1,600,000		
22F-E2 <sup>13</sup>	HF/HF	2200	1100	500 <sup>12</sup>	500 <sup>12</sup>	155	1,600,000	1400	375	135	70	1,400,000	950	1400	1,400,000		
22F-E3 <sup>9</sup>	DF/N3WW	2200	1100	650	650 <sup>12</sup>	90 <sup>12</sup>	1,700,000	1250	255	135 <sup>17</sup>	70 <sup>17</sup>	1,400,000	825	750	1,400,000		
22F-E4 <sup>9</sup>	DF/N3DF	2200	1100	650	650 <sup>12</sup>	90 <sup>12</sup>	1,800,000	1350	470	135	70	1,600,000	950	950	1,600,000		
22F-E5 <sup>10</sup>	DF/DF	2200	2200	650	650	165	1,700,000	1650	560	145	75	1,600,000	1100	1650	1,600,000		
22F-E6 <sup>10,13</sup>	HF/HF	2200	2200	500 <sup>12</sup>	500 <sup>12</sup>	155	1,700,000	1550	375	135	70	1,500,000	1050	1500	1,500,000		
24F-E1	DF/DF	2400	1200	650	650	165	1,800,000	1550	560	145	75	1,600,000	1100	1600	1,600,000		
24F-E2 <sup>13</sup>	HF/HF	2400	1200	500 <sup>12</sup>	500 <sup>12</sup>	155	1,700,000	1450	375	135	70	1,500,000	1000	1400	1,500,000		
24F-E3	DF/HF	2400	1200	650	650 <sup>12</sup>	155	1,800,000	1500	375	135	70	1,500,000	1050	1550	1,500,000		
24F-E4	DF/DF	2400	1200	650	650	165	1,600,000	1650	560	145	75	1,700,000	1100	1700	1,700,000		
24F-E5	DF/DF	2400	1200	650	650 <sup>12</sup>	165	1,800,000	1650	560	145	75	1,600,000	1100	1550	1,600,000		
24F-E6 <sup>13</sup>	HF/WW	2400	1200	500 <sup>12</sup>	500 <sup>12</sup>	140	1,800,000	1250	255	130 <sup>17</sup>	65 <sup>17</sup>	1,400,000	925	1350	1,400,000		
24F-E7 <sup>9</sup>	DF/N3WW	2400	1200	650	650	90 <sup>12</sup>	1,900,000	1400	255	135 <sup>17</sup>	70 <sup>17</sup>	1,600,000	975	875	1,600,000		
24F-E8 <sup>9</sup>	DF/N3DF	2400	1200	650	650	90 <sup>12</sup>	1,900,000	1400	470	135	70	1,700,000	1000	1050	1,700,000		
24F-E9 <sup>9,13</sup>	HF/N3HF	2400	1200	500 <sup>12</sup>	500 <sup>12</sup>	90 <sup>12</sup>	1,800,000	1350	375	135	70	1,600,000	950	825	1,600,000		
24F-E10 <sup>10</sup>	DF/DF	2400	2400	650	650	165	1,900,000	1850	560	145	75	1,700,000	1300	1750	1,700,000		
24F-E11 <sup>10,13</sup>	HF/HF	2400	2400	500 <sup>12</sup>	500 <sup>12</sup>	155	1,800,000	1600	375	135	70	1,500,000	1150	1550	1,500,000		
24F-E12 <sup>10</sup>	DF/HF	2400	2400	650	650	155	1,900,000	1750	375	135	70	1,600,000	1200	1600	1,600,000		
24F-E13 <sup>10</sup>	DF/DF	2400	2400	650	650	165	1,800,000	1950	560	145	70	1,700,000	1250	1700	1,700,000		
24F-E14	DF/DF	2400	1200	650	650	165	1,800,000	1600	560	145	75	1,600,000	1050	1600	1,600,000		
24F-E15	HF/HF	2400	1200	500	500	155	1,800,000	1500	375	135	70	1,500,000	1000	1550	1,500,000		
Wet-use factors		0.8	0.8	0.53	0.53	0.875	0.833	0.8	0.53	0.875	0.875	0.833	0.8	0.73	0.833		

**TABLE 5A—DESIGN VALUES FOR STRUCTURAL GLUED LAMINATED SOFTWOOD TIMBERS:  
MEMBERS STRESSED PRIMARILY IN BENDING<sup>1,2,3,4,6,14</sup>**

Design values are for normal load duration and dry conditions of use. See footnotes, and other provisions in the National Design Specification for Wood Construction, for adjustments of calculated values.

Combination Symbol <sup>6</sup>	Species Outer Laminations/ Core Laminations <sup>7</sup>	Design values in pounds per square inch																
		BENDING ABOUT X-X AXIS							BENDING ABOUT Y-Y AXIS							AXIALLY LOADED		
		Loaded Perpendicular to Wide Faces of Laminations				Loaded Parallel to the Wide Faces of the Laminations												
		Extreme Fiber in Bending <sup>5</sup>	Compression Perp. to Grain						Extreme Fiber in Bending <sup>5,15</sup>	Compression Perpendicular to Grain Side faces	Horizontal Shear			Modulus of Elasticity	Tension Parallel to Grain Ft	Compression Parallel to Grain Fc	Modulus of Elasticity	
		Tension Zone Stressed in Tension	Compression Zone Stressed <sup>8</sup> in Tension	Tension Face <sup>11,12</sup>	Compression Face <sup>11,12</sup>	Horizontal Shear <sup>12</sup>	Modulus of Elasticity	Exx	Fbxx	Fcxx	Fvyy	Fvyy	Eyy	E				
<b>VISUALLY GRADED SOUTHERN PINE</b>																		
16F-V1	SP/SP	1600	800	560 <sup>11,12</sup>	560 <sup>12</sup>	200	1,400,000	1450	560	175	90	1,300,000	950	1450	1,300,000			
16F-V2	SP/SP	1600	800	560 <sup>11,12</sup>	560 <sup>12</sup>	200	1,400,000	1600	560	175	90	1,400,000	1000	1550	1,400,000			
16F-V3	SP/SP	1600	800	650	650	200	1,400,000	1450	560	175	90	1,300,000	975	1450	1,300,000			
16F-V4 <sup>9</sup>	SP/SP	1600	800	560 <sup>11,12</sup>	560 <sup>12</sup>	90 <sup>12</sup>	1,300,000	975	470	150	75	1,200,000	650	950	1,200,000			
16F-V5 <sup>10</sup>	SP/SP	1600	1600	560 <sup>11,12</sup>	560 <sup>12</sup>	200	1,400,000	1600	560	175	90	1,400,000	1050	1550	1,400,000			
20F-V1	SP/SP	2000	1000	650	560 <sup>12</sup>	200	1,500,000	1450	560	175	90	1,400,000	1000	1450	1,400,000			
20F-V2	SP/SP	2000	1000	650	560 <sup>12</sup>	200	1,600,000	1450	560	175	90	1,400,000	1050	1550	1,400,000			
20F-V3	SP/SP	2000	1000	560 <sup>11,12</sup>	560 <sup>12</sup>	200	1,400,000	1600	560	175	90	1,400,000	1000	1500	1,400,000			
20F-V4 <sup>9</sup>	SP/SP	2000	1000	650	560 <sup>12</sup>	90 <sup>12</sup>	1,500,000	1100	470	150	75	1,300,000	725	950	1,300,000			
20F-V5 <sup>10</sup>	SP/SP	2000	2000	650	650	200	1,600,000	1450	560	175	90	1,400,000	1050	1550	1,400,000			
22F-V1	SP/SP	2200	1100	650	560 <sup>12</sup>	200	1,600,000	1600	560	175	90	1,500,000	1050	1650	1,500,000			
22F-V2	SP/SP	2200	1100	560 <sup>11,12</sup>	560 <sup>12</sup>	200	1,400,000	1600	560	175	90	1,400,000	1000	1500	1,400,000			
22F-V3	SP/SP	2200	1100	650	560 <sup>12</sup>	200	1,600,000	1500	560	175	90	1,400,000	1050	1500	1,400,000			
22F-V4 <sup>9</sup>	SP/SP	2200	1100	650	560 <sup>12</sup>	90 <sup>12</sup>	1,600,000	1250	470	155	80	1,400,000	825	1000	1,400,000			
22F-V5 <sup>10</sup>	SP/SP	2200	2200	650	650	200	1,600,000	1600	470	175	90	1,500,000	1050	1600	1,500,000			
24F-V1	SP/SP	2400	1200	650	560 <sup>12</sup>	200	1,700,000	1500	560	175	90	1,500,000	1100	1350	1,500,000			
24F-V2	SP/SP	2400	1200	650	650	200	1,700,000	1600	560	175	90	1,500,000	1100	1600	1,500,000			
24F-V3	SP/SP	2400	1200	650	650	200	1,800,000	1600	560	175	90	1,600,000	1150	1700	1,600,000			
24F-V4 <sup>9</sup>	SP/SP	2400	1200	650	560	90 <sup>12</sup>	1,700,000	1250	470	155	80	1,400,000	850	1050	1,400,000			
24F-V5 <sup>10</sup>	SP/SP	2400	2400	650	650	200	1,700,000	1600	560	175	90	1,500,000	1150	1700	1,500,000			
24F-V6	SP/SP	2400	1200	650	650	200	1,700,000	1500	560	175	90	1,500,000	1150	1750	1,500,000			
<b>E-RATED SOUTHERN PINE</b>																		
16F-E1	SP/SP	1600	800	560 <sup>12</sup>	560 <sup>12</sup>	200	1,600,000	1550	560	175	90	1,500,000	1050	1600	1,500,000			
16F-E2 <sup>9</sup>	SP/SP	1600	800	560 <sup>12</sup>	560 <sup>12</sup>	90 <sup>12</sup>	1,600,000	950	470	145	75	1,300,000	700	1050	1,300,000			
16F-E3 <sup>10</sup>	SP/SP	1600	1600	560 <sup>12</sup>	560 <sup>12</sup>	200	1,600,000	1700	560	175	90	1,500,000	1100	1650	1,500,000			
20F-E1	SP/SP	2000	1000	560 <sup>12</sup>	560 <sup>12</sup>	200	1,700,000	1600	560	175	90	1,500,000	1050	1600	1,500,000			
20F-E2 <sup>9</sup>	SP/SP	2000	1000	650	560 <sup>12</sup>	90 <sup>12</sup>	1,600,000	1100	470	150	75	1,400,000	750	1000	1,400,000			
20F-E3 <sup>10</sup>	SP/SP	2000	2000	560 <sup>12</sup>	560 <sup>12</sup>	200	1,700,000	1800	560	175	90	1,500,000	1150	1700	1,500,000			
22F-E1	SP/SP	2200	1100	650	560 <sup>12</sup>	200	1,700,000	1600	560	175	90	1,500,000	1050	1650	1,500,000			
22F-E2 <sup>9</sup>	SP/SP	2200	1100	650	560 <sup>12</sup>	200	1,600,000	1250	470	155	80	1,400,000	850	1050	1,400,000			
22F-E3 <sup>10</sup>	SP/SP	2200	2200	650	650	200	1,700,000	1750	560	175	90	1,500,000	1150	1650	1,500,000			
24F-E1	SP/SP	2400	1200	650	560 <sup>12</sup>	200	1,800,000	1600	560	175	90	1,600,000	1100	1750	1,600,000			
24F-E2	SP/SP	2400	1200	650	650	200	1,900,000	1700	560	175	90	1,600,000	1150	1700	1,600,000			
24F-E3 <sup>9</sup>	SP/SP	2400	1200	650	650	90 <sup>12</sup>	1,800,000	1300	470	155	80	1,500,000	950	1100	1,500,000			
24F-E4 <sup>10</sup>	SP/SP	2400	2400	650	650	200	1,800,000	2000	560	175	90	1,600,000	1250	1750	1,600,000			
Wet-use factors		0.8	0.8	0.53	0.53	0.875	0.833	0.8	0.53	0.875	0.875	0.833	0.8	0.73	0.833			

**Table 5A Footnotes**  
**Applicable to STRUCTURAL GLUED LAMINATED SOFTWOOD TIMBERS:**  
**MEMBERS STRESSED PRIMARILY IN BENDING**

1. Design values in this table are based on combinations conforming to AITC 117-84—"Design Standard Specifications for Structural Glued Laminated Timber for Softwood Species", by American Institute of Timber Construction, and manufactured in accordance with American National Standard ANSI/AITC A190.1-1983, "Structural Glued Laminated Timber".
2. The combinations in this table are intended primarily for members stressed in bending due to loads applied perpendicular to the wide faces of the laminations. Design values are tabulated, however, for loading both perpendicular and parallel to the wide faces of the laminations, and for axial loading. For combinations applicable to members loaded primarily axially or parallel to the wide faces of the laminations, see Table 5B.
3. Design values in this table are applicable to members having 4 or more laminations. For members having 2 or 3 laminations, see Table 5B.
4. When moisture content in service will be 16 percent or more, tabulated design values shall be multiplied by the modification factor for wet service conditions, as given in the bottom line of this table.
5. The tabulated design values in bending are applicable to members 12" or less in depth. For members greater than 12" in depth, the requirements of Section 5.3.4 of the National Design Specification apply.
6. The 22F and 24F combinations for members 15" and less in depth may not be readily available and the designer should check on availability prior to specifying. The 16F and 20F combinations are generally available for members 15" and less in depth.
7. The symbols used for species are DF = Douglas Fir-Larch, DFS = Douglas Fir South, HF = Hem-Fir, WW = Western Woods or Canadian softwood species, and SP = Southern Pine (N3 refers to No. 3 structural joists and planks or structural light framing grade). For design values for California Redwood, see AITC 117-84-DESIGN.
8. Design values in this column are for extreme fiber stress in bending when the member is loaded such that the compression zone laminations are subjected to tensile stresses. For more information, see AITC 117-84-DESIGN. The values in this column may be increased 200 psi where end joint spacing restrictions are applied to the compression zone when stressed in tension.
9. These combinations are intended for straight or slightly cambered members for dry use and industrial appearance grade, because they may contain wane. If wane is omitted these restrictions do not apply.
10. These combinations are balanced and are intended for members continuous or cantilevered over supports and provide equal capacity in both positive and negative bending.
11. For bending members greater than 15" in depth, these design values for compression perpendicular to grain are 650 psi on the tension face.
12. These design values may be increased in accordance with AITC 117-84-DESIGN when member conforms with special construction requirements therein. For more information see AITC 117-84-DESIGN.
13. For these combinations manufacturers may substitute E-rated Douglas Fir-Larch laminations that are 200,000 psi higher in modulus of elasticity than the specified E-rated Hem-Fir, with no change in design values.
14. For fastener design, the appropriate timber connector load group, lag bolt and driven fastener load group, and bolt design value can be classified by the design value for compression perpendicular to grain, as shown in the following table:

Species classification for fastener design				
Compression Perpendicular to Grain Design Value $F_{cL}$ psi	Timber Connector Load Grouping (NDS Table 8.1A.)	Lag Screw and Driven Fastener Load Grouping (NDS Table 8.1A.)	Bolt Design Values in NDS Table 8.5A	
650*	A	II	Column 1	
590 or 560	B	II	Column 3	
500**	C	III	Column 8	
470 or 375	C	III	Column 8	
315	C	III	Column 8	
255	D	IV	Column 12	

\*For  $F_{cL} = 650$  psi for Douglas Fir South, use timber connector Group B, driven fastener group II and bolt values from column 3.

\*\*For  $F_{cL} = 500$  psi for Douglas Fir South, use bolt values from column 6.

15. Footnote 5 to Table 5B also applies.
16. The values for horizontal shear,  $F_{yy}$ , apply to members manufactured using multiple piece laminations with unbonded edge joints. For members manufactured using single piece laminations or using multiple piece laminations with bonded edge joints the horizontal shear values in the previous column apply.
17. Where Douglas Fir South is used in place of all Western Wood laminations required, the design value for horizontal shear is the same as for combinations using all Douglas Fir-Larch.

**TABLE 5B—DESIGN VALUES FOR STRUCTURAL GLUED LAMINATED SOFTWOOD TIMBERS:  
MEMBERS STRESSED PRIMARILY IN AXIAL TENSION OR COMPRESSION**  
(or loaded in bending parallel to the wide face of laminations)<sup>1,2,3,11</sup>

Design values are for normal load duration and dry conditions of use. See footnotes, and other provisions in the National Design Specification  
for Wood Construction for adjustments of calculated values

Combination Symbol	Species <sup>4</sup>	Modulus of Elasticity	Compression <sup>10</sup> Perpendicular To Grain	Design values in pounds per square inch												
				AXIALLY LOADED			BENDING ABOUT Y-Y AXIS Loaded Parallel to Wide Faces of Laminations								BENDING ABOUT X-X AXIS Loaded Perpendicular to Wide Faces of Laminations	
				Tension Parallel To Grain	Compression Parallel To Grain		Extreme Fiber in Bending <sup>5,6</sup>			Horizontal Shear <sup>7</sup>				Extreme Fiber in Bending <sup>6</sup>		Horizontal Shear <sup>7</sup>
					2 or More Laminations	4 or More Laminations	2 or 3 Laminations	4 or more Laminations	3 Laminations	2 Laminations	4 or More Laminations (For members with multiple piece laminations) <sup>12</sup>	4 or More Laminations	3 Laminations	2 Laminations	2 Laminations to 15" deep <sup>8</sup>	4 or More Laminations <sup>9</sup>
		E	F <sub>CL</sub>	F <sub>t</sub>	F <sub>c</sub>	F <sub>c</sub>	F <sub>bxy</sub>	F <sub>byy</sub>	F <sub>byy</sub>	F <sub>vyy</sub>	F <sub>vyy</sub>	F <sub>vyy</sub>	F <sub>vyy</sub>	F <sub>bxx</sub>	F <sub>bxx</sub>	F <sub>vxx</sub>
<b>VISUALLY GRADED WESTERN SPECIES</b>																
1	DF	1,500,000	560 <sup>10</sup>	900	1550	1200	1450	1250	1000	75	145	135	125	1250	1500	165
2	DF	1,700,000	560 <sup>10</sup>	1250	1900	1600	1800	1600	1300	75	145	135	125	1700	2000	165
3	DF	1,800,000	650	1450	2300	1850	2100	1850	1550	75	145	135	125	2000	2300	165
4	DF	1,900,000	590 <sup>10</sup>	1400	2100	1900	2200	2000	1650	75	145	135	125	1900	2200	165
5	DF	2,000,000	650	1600	2400	2100	2400	2100	1800	75	145	135	125	2200	2400	165
6	DF	1,400,000	470	350	875	550	550	550	550	60	120	115	105	450	—	140
7	DF	1,500,000	560	900	1550	700	1450	1250	1000	75	145	135	125	1000	—	165
8	DF	1,600,000	560 <sup>10</sup>	1000	1550	1150	1600	1550	1300	75	145	135	125	1350	1600	165
9	DF	1,800,000	650	1150	1800	1350	1850	1800	1500	75	145	135	125	1600	1850	165
10	DF	1,800,000	560 <sup>10</sup>	1300	1950	1450	1950	1750	1500	75	145	135	125	1750	2100	165
11	DF	2,000,000	650	1500	2300	1700	2300	2100	1750	75	145	135	125	2100	2400	165
12	DF	1,800,000	560 <sup>10</sup>	1400	1950	1650	2100	1950	1650	75	145	135	125	1900	2200	165
13	DF	2,000,000	650	1600	2300	1950	2400	2300	1950	75	145	135	125	2200	2400	165
14	HF	1,300,000	375 <sup>10</sup>	800	1100	975	1200	1050	850	70	135	130	115	1100	1300	155
15	HF	1,400,000	375 <sup>10</sup>	1050	1350	1300	1500	1350	1100	70	135	130	115	1450	1700	155
16	HF	1,600,000	375 <sup>10</sup>	1200	1500	1450	1750	1550	1300	70	135	130	115	1600	1900	155
17	HF	1,700,000	500	1400	1750	1700	2000	1850	1550	70	135	130	115	1900	2200	155
18	HF	1,300,000	375	425	900	575	700	700	700	70	135	130	115	575	—	155
19	HF	1,400,000	375 <sup>10</sup>	850	1300	975	1350	1300	1100	70	135	130	115	1150	1350	155
20	HF	1,600,000	375 <sup>10</sup>	975	1450	1250	1550	1500	1250	70	135	130	115	1350	1550	155
21	HF	1,600,000	375 <sup>10</sup>	1100	1450	1350	1750	1650	1400	70	135	130	115	1500	1750	155
22	WW	1,000,000	255	525	850	675	800	700	550	60	120	115	105	725	850	140
23	WW	1,000,000	255	275	625	450	450	450	450	60	120	115	105	400	—	140
24	WW	1,100,000	255	550	900	700	900	875	725	60	120	115	105	775	900	140
25	WW	1,200,000	255	650	1000	875	1050	1000	850	60	120	115	105	875	1050	140
26	WW	1,200,000	255	750	1000	1000	1150	1100	925	60	120	115	105	1000	1150	140
59	DFS	1,100,000	500	800	1400	1050	1200	1050	850	75	145	135	125	1050	1250	165
60	DFS	1,300,000	500	1050	1750	1400	1750	1550	1150	75	145	135	125	1450	1700	165
61	DFS	1,500,000	650	1350	2200	1850	2000	1800	1500	75	145	135	125	1850	2200	165
Wet-use factors		0.833	0.53	0.8	0.73	0.73	0.8	0.8	0.8	0.875	0.875	0.875	0.875	0.8	0.8	0.875

**TABLE 5B—DESIGN VALUES FOR STRUCTURAL GLUED LAMINATED SOFTWOOD TIMBERS:  
MEMBERS STRESSED PRIMARILY IN AXIAL TENSION OR COMPRESSION**  
(or loaded in bending parallel to the wide face of laminations)<sup>1,2,3,11</sup>

Design values are for normal load duration and dry conditions of use. See footnotes, and other provisions in the National Design Specification for Wood Construction for adjustments of calculated values

Combination Symbol	Species <sup>4</sup>	Modulus of Elasticity	Compression <sup>10</sup> Perpendicular To Grain	Design values in pounds per square inch													
				AXIALLY LOADED			BENDING ABOUT Y-Y AXIS Loaded Parallel to Wide Faces of Laminations								BENDING ABOUT X-X AXIS Loaded Perpendicular to Wide Faces of Laminations		
				Tension Parallel To Grain	Compression Parallel To Grain		Extreme Fiber in Bending <sup>5,6</sup>			Horizontal Shear <sup>7</sup>				Extreme Fiber in Bending <sup>6</sup>		Horizontal Shear <sup>7</sup>	
					2 or More Lami- nations	4 or More Lami- nations	2 or 3 Lami- nations	4 or more Lami- nations	3 Lami- nations	2 Lami- nations	4 or More Lami- nations with multiple piece lami- nations) <sup>12</sup>	F <sub>vyy</sub>	3 Lami- nations	2 Lami- nations	2 Lami- nations to 15" deep <sup>8</sup>	4 or More Lami- nations <sup>9</sup>	
		E	F <sub>cL</sub>	F <sub>t</sub>	F <sub>c</sub>	F <sub>c</sub>	F <sub>bby</sub>	F <sub>bby</sub>	F <sub>bby</sub>	F <sub>bby</sub>	F <sub>vyy</sub>	F <sub>vyy</sub>	F <sub>vyy</sub>	F <sub>bxx</sub>	F <sub>bxx</sub>	F <sub>vxx</sub>	
<b>E-RATED WESTERN SPECIES</b>																	
27	DF	1,800,000	650	900	1750	1200	1450	1250	1000	75	145	135	125	1250	1500	1500	165
28	DF	2,000,000	650	1100	2000	1400	1450	1250	1000	75	145	135	125	1500	1750	2000	165
29	DF	2,200,000	650	1250	2300	1550	1650	1400	1150	75	145	135	125	1700	2100	2400	165
30	DF	1,800,000	650	1550	2100	1700	2400	2400	2100	75	145	135	125	1800	2100	2400	165
31	DF	2,000,000	650	1800	2400	1900	2400	2400	2400	75	145	135	125	2100	2400	2700	165
32	DF	2,200,000	650	1800	2400	2100	2400	2400	2400	75	145	135	125	2300	2600	2900	165
62	DF	2,100,000	650	1150	2200	1500	1550	1350	1100	75	145	135	125	1600	1900	2200	165
63	DF	2,100,000	650	1800	2400	2000	2400	2400	2400	75	145	135	125	2200	2400	2700	165
33	HF	1,500,000	500	800	1050	950	1200	1050	850	70	135	130	115	1100	1300	1500	155
34	HF	1,800,000	500	900	1300	1200	1450	1250	1000	70	135	130	115	1250	1500	1750	155
35	HF	2,000,000	500	1100	1550	1400	1450	1250	1000	70	135	130	115	1500	1750	2000	155
36	HF	1,500,000	500	1200	1450	1300	2100	1900	1700	70	135	130	115	1400	1650	1900	155
37	HF	1,800,000	500	1550	1950	1700	2400	2400	2100	70	135	130	115	1800	2100	2400	155
38	HF	2,000,000	500	1800	2400	1900	2400	2400	2400	70	135	130	115	2100	2400	2700	155
39	WW	1,500,000	255	800	1200	950	1200	1050	850	60	120	115	105	1100	1300	1500	140
40	WW	1,800,000	255	900	1500	1200	1450	1250	1000	60	120	115	105	1250	1500	1750	140
41	WW	2,000,000	255	1100	1750	1400	1450	1250	1000	60	120	115	105	1500	1750	2000	140
42	WW	1,500,000	255	1200	1550	1300	2100	1900	1700	60	120	115	105	1400	1650	1900	140
43	WW	1,800,000	255	1550	1950	1700	2400	2400	2100	60	120	115	105	1800	2100	2400	140
44	WW	2,000,000	255	1800	2200	1900	2400	2400	2400	60	120	115	105	2100	2400	2700	140
Wet-use factors		0.833	0.53	0.8	0.73	0.73	0.8	0.8	0.8	0.875	0.875	0.875	0.875	0.8	0.8	0.875	

**TABLE 5B—DESIGN VALUES FOR STRUCTURAL GLUED LAMINATED SOFTWOOD TIMBERS:  
MEMBERS STRESSED PRIMARILY IN AXIAL TENSION OR COMPRESSION**  
(or loaded in bending parallel to the wide face of laminations)<sup>1,2,3,11</sup>

Design values are for normal load duration and dry conditions use. See footnotes, and other provisions in the National Design Specification for Wood Construction for adjustments of calculated values

Combination Symbol	Species <sup>4</sup>	Modulus of Elasticity	Compression <sup>10</sup> Perpendicular To Grain	Design values in pounds per square inch																
				AXIALLY LOADED			BENDING ABOUT Y-Y AXIS Loaded Parallel to Wide Faces of Laminations								BENDING ABOUT X-X AXIS Loaded Perpendicular to Wide Faces of Laminations					
				Tension Parallel To Grain	Compression Parallel To Grain		Extreme Fiber in Bending <sup>5,6</sup>			Horizontal Shear <sup>7</sup>				Extreme Fiber in Bending <sup>6</sup>	Horizontal Shear <sup>7</sup>					
				2 or More Laminations	4 or More Laminations	2 or 3 Laminations	4 or more Laminations	3 Laminations	2 Laminations	4 or More Laminations (For members with multiple piece laminations) <sup>12</sup>	4 or More Laminations	3 Laminations	2 Laminations	2 Laminations to 15" deep <sup>8</sup>	4 or More Laminations <sup>9</sup>	2 or More Laminations				
				E	F <sub>cL</sub>	F <sub>t</sub>	F <sub>c</sub>	F <sub>c</sub>	F <sub>bYY</sub>	F <sub>bYY</sub>	F <sub>bYY</sub>	F <sub>vYY</sub>	F <sub>vYY</sub>	F <sub>bXX</sub>	F <sub>bXX</sub>	F <sub>vXX</sub>				
<b>VISUALLY GRADED SOUTHERN PINE</b>																				
45	SP	1,100,000	470	325	850	550	550	550	550	60	120	115	105	450	—	140				
46	SP	1,300,000	560	900	1500	675	1450	1250	1000	90	175	165	150	1000	—	200				
47	SP	1,400,000	560 <sup>10</sup>	1200	1900	1150	1750	1550	1300	90	175	165	150	1400	1600	200				
48	SP	1,700,000	650	1400	2200	1350	2000	1800	1500	90	175	165	150	1600	1900	200				
49	SP	1,700,000	560 <sup>10</sup>	1350	2100	1450	1950	1750	1500	90	175	165	150	1800	2100	200				
50	SP	1,900,000	650	1550	2300	1700	2300	2100	1750	90	175	165	150	2100	2400	200				
51	SP	1,700,000	560 <sup>10</sup>	1300	1900	1600	2100	1950	1650	90	175	165	150	1750	2100	200				
52	SP	1,900,000	650	1500	2200	1850	2400	2300	1950	90	175	165	150	2100	2400	200				
<b>E-RATED SOUTHERN PINE</b>																				
53	SP	1,800,000	650	900	1900	1200	1450	1250	1000	90	175	165	150	1250	1500	200				
54	SP	2,000,000	650	1100	2300	1400	1450	1250	1000	90	175	165	150	1500	1750	200				
55	SP	2,200,000	650	1250	2400	1550	1650	1400	1150	90	175	165	150	1700	2000	200				
56	SP	1,800,000	650	1550	1850	1700	2400	2400	2100	90	175	165	150	1800	2100	200				
57	SP	2,000,000	650	1800	2400	1900	2400	2400	2400	90	175	165	150	2100	2400	200				
58	SP	2,200,000	650	1800	2400	2100	2400	2400	2400	90	175	165	150	2300	2400	200				
Wet-use factors				0.833	0.53	0.8	0.73	0.73	0.8	0.8	0.875	0.875	0.875	0.875	0.875	0.8	0.8	0.875		

**Table 5B. Footnotes**

**Applicable to STRUCTURAL GLUED LAMINATED SOFTWOOD TIMBERS: MEMBERS STRESSED PRIMARILY IN AXIAL TENSION OR COMPRESSION**

1. Design values in this table are based on combinations conforming to "AITC 117-84—DESIGN—Standard Specifications for Structural Glued Laminated Timber of Softwood Species", by American Institute of Timber Construction, and manufactured in accordance with American National Standard ANSI/AITC A190.1-1983, "Structural Glued Laminated Timber".

2. The combinations in this table are intended primarily for members loaded either axially or in bending with the loads acting parallel to the wide faces of the laminations (bending about Y-Y axis). Design values for bending due to load applied perpendicular to the wide faces of the laminations (bending about X-X axis) are also included, although the combinations in Table 5A are usually better suited for this condition of loading.

3. When moisture content in service will be 16 percent or more, tabulated design values shall be multiplied by the modification factor for wet service conditions, as given in the bottom line of this table.

4. The symbols used for species are DF = Douglas Fir-Larch, DFS = Douglas Fir South, HF = Hem-Fir, WW = Western Woods and Canadian softwood species, and SP = Southern Pine. For design values for California Redwood, see AITC 117-84—DESIGN.

5. The values of F<sub>bYY</sub> in Table 5B are based on members 12" in depth (bending about Y-Y axis). When member depth is less than 12", the values of F<sub>bYY</sub> may be multiplied by the following factors:

Depth	Multiply tabulated F <sub>bYY</sub> by:
10.75"	1.01
8.75"	1.04
6.75"	1.07
5.125"	1.10
3.125"	1.16

6. The tabulated design values in bending are applicable to members 12" or less in depth. For members greater than 12" in depth, the requirements of Section 5.3.4 of the National Design Specification apply to F<sub>bYY</sub> and F<sub>bXX</sub>.

7. The design values in horizontal shear in Table 5B are based on members that do not contain wane.

8. The design values in bending about the X-X axis in this column are for members up to 15" in depth without tension laminations.

9. The design values in bending about the X-X axis in this column are for members having specific tension laminations, and apply to members having 4 or more laminations. When these values are used in design and the member is specified by combination symbol, the design should also specify the required design value in bending.

10. These design values may be increased in accordance with AITC 117-84—DESIGN when member conforms with special construction requirements therein. For more information see AITC 117-84—DESIGN.

11. Footnote 14 of Table 5A applies also to Table 5B.

12. The values for horizontal shear, F<sub>vYY</sub>, apply to members manufactured using multiple piece laminations with unbonded edge joints. For members using single piece laminations or using multiple piece laminations with bonded edge joints the horizontal shear values tabulated in the next three columns apply.

**Table 5C—DESIGN VALUES FOR STRUCTURAL GLUED LAMINATED HARDWOOD TIMBER<sup>1,2</sup>**

Design values are for normal load duration and dry conditions<sup>3</sup> of use. See footnotes, and other provisions in the National Specification for Wood Construction, for adjustments of calculated values.

Pounds per square inch

**PART A**

SPECIES	Multiply the appropriate stress module in part B by the factors below to determine design value for			Design pounds in
	Extreme fiber in bending "F <sub>B</sub> " or tension parallel to grain "F <sub>T</sub> " Factor	Compression parallel to grain F <sub>C</sub> Factor	Modulus of elasticity E Factor	
Hickory, true and pecan.....	3.85	3.05	1.80	260
Beech, American.....	3.05	2.45	1.70	230
Birch, sweet and yellow.....	3.05	2.45	1.90	230
Elm, rock .....	3.05	2.45	1.40	230
Maple, black and sugar (hard maple).....	3.05	2.45	1.70	230
Ash, commercial white .....	2.80	2.20	1.70	230
Oak, commercial red and white .....	2.80	2.05	1.60	230
Elm, American and slippery (white or soft elm) .....	2.20	1.60	1.40	190
Sweetgum (red or sap gum) .....	2.20	1.60	1.40	190
Tupelo, black (blackgum).....	2.20	1.60	1.20	190
Tupelo, water .....	2.20	1.60	1.30	190
Ash, black .....	2.00	1.30	1.30	170
Yellow poplar .....	2.00	1.45	1.50	150
Cottonwood, Eastern.....	1.55	1.20	1.20	110
Modification factor for wet service conditions	0.80	0.73	0.833	0.875

**PART B — Values for use in computing design values with the factors of Part A together with limitations required to permit the use of such stresses**

Combination symbol	Ratio of size of maximum permitted knot to finished width of lamination	Number of laminations	Extreme fiber in bending <sup>4</sup>			Tension parallel to grain <sup>4</sup>		Compression parallel to grain <sup>4</sup>		Modulus of elasticity	
			Stress module	Maximum grain slope		Stress module	Maximum grain slope	Stress module	Maximum grain slope		
				Outer lams. <sup>5</sup>	Core						
A	0.1	4 to 14 15 or more	800	1:16	1:8	500	1:16	970	1:15	1,000,000	
			800	1:16	1:8	500	1:16	970	1:15		
B	0.2	4 to 14 15 or more	770	1:16	1:8	500	1:16	920	1:15	1,000,000	
			800	1:16	1:8	500	1:16	930	1:15		
C	0.3	4 to 14 15 or more	600	1:12	1:8	450	1:15	860	1:14	900,000	
			660	1:12	1:8	450	1:16	870	1:14		
D	0.4	4 to 14 15 or more	450	1:8	1:8	350	1:10	780	1:12	800,000	
			520	1:8	1:8	350	1:12	810	1:12		
E	0.5	4 to 14 15 or more	300	1:8	1:8	300	1:8	690	1:10	800,000	
			380	1:8	1:8	300	1:8	730	1:10		

**Table 5C. Footnotes Applicable to STRUCTURAL GLUED LAMINATED HARDWOOD TIMBERS**

1. Standard Specifications for Hardwood Glued Laminated Timbers, AITC 119-85, by American Institute of Timber Construction, applies.

2. The design values in bending obtained from this Table apply when the wide faces of the laminations are normal to the direction of the load. They also apply when the loading is parallel to the wide faces of the laminations, provided certain additional restrictions, given in the applicable specification indicated in Note 1, are applied.

3. For wet service conditions, where moisture content of the member will be 16 percent or more, multiply design value by the appropriate modification factor from the bottom of Part A of this table.

4. Stress modules apply only when laminations have a slope of grain no steeper than the values listed, as required in the specification indicated in Note 1. For tension and compression parallel to grain values to apply, all laminations must conform to slope of grain requirements. As an alternative to specifying more restrictive slope of grain limitations in order to use tabulated values for "secondary" stresses, such as when a member is subject to reversal of axial load or to combined flexure and axial load, consult American Institute of Timber Construction for advice on "secondary" stresses appropriate for the slope of grain required for the principal stress."

5. For bending, outer laminations means each outer 10 percent of the depth of the member, measured from each face at any cross section of the member as finally installed.